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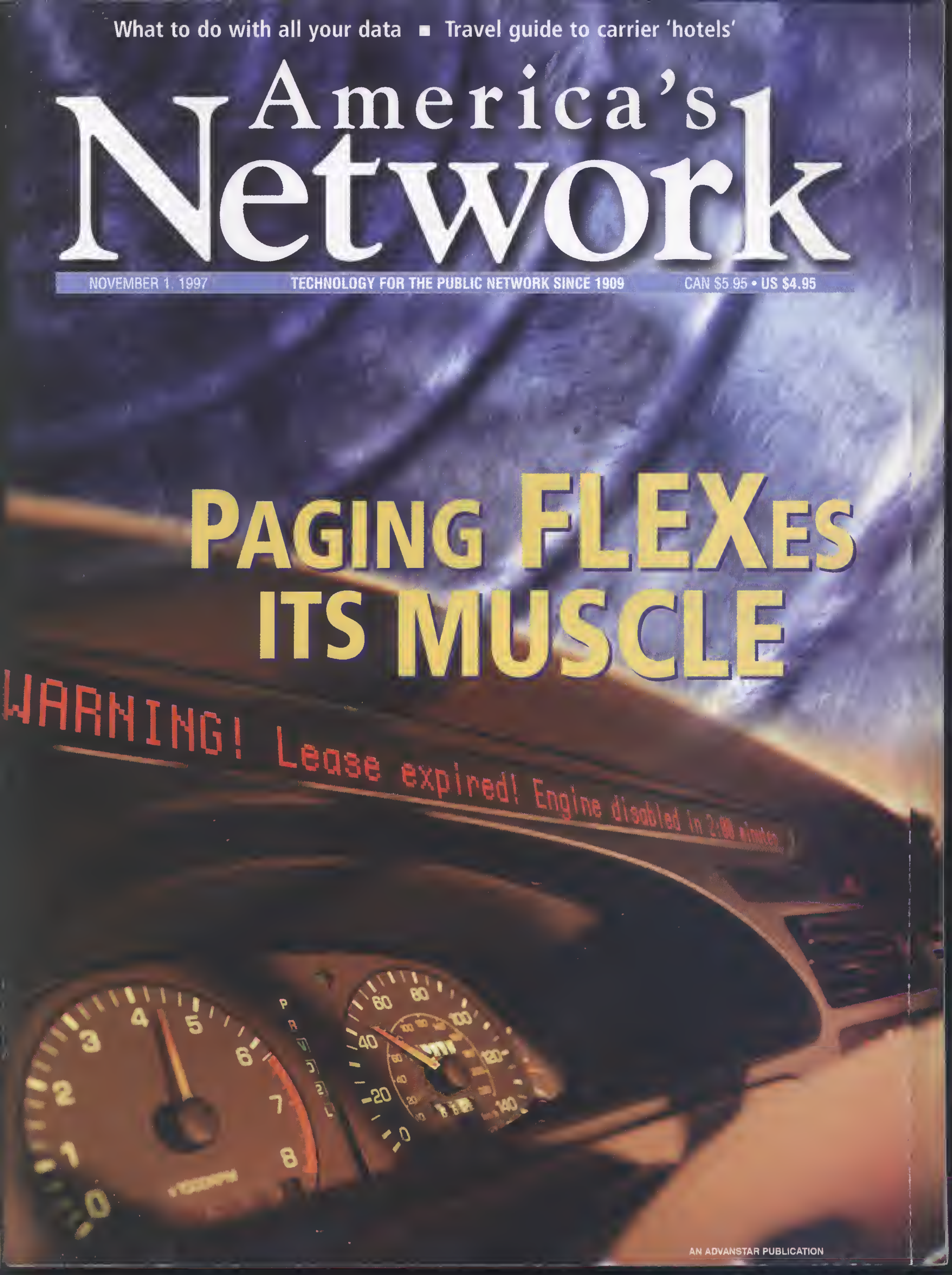
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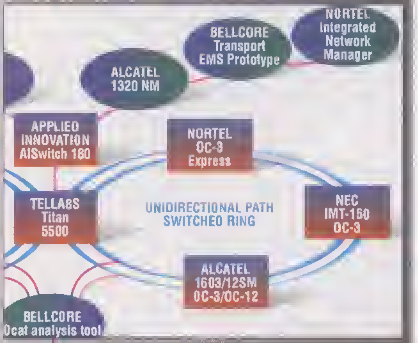
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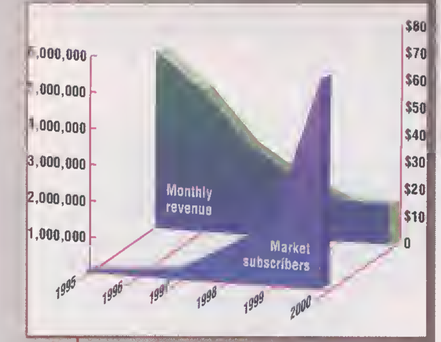

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Telemetry applications rev up the paging market, which is expected to more than double today's subscriber revenue (page 25). Photo montage illustration by Jon Fraze

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DAVID KOPF

Trouble's a-brewin'

The cyber seas aren't just stormy—they're percolating. By now, most of you are well aware of Sun Microsystems Inc.'s (Cupertino, Calif.) suit against Microsoft Corp. (Redmond, Wash.), but for those of you who have been on vacation, I'll break it down:

Sun is suing Microsoft for $35 million, compensatory damages and attorneys fees because it believes Microsoft breached its Java licensing contract through incompatible implementation of Java in its Microsoft Internet Explorer browser version 4.0 and software developer kit. Apart from a major publicity campaign to alert industry media to the infraction, Sun is barring Microsoft access to any new Java technologies and has also sought an injunction to force Microsoft to comply with the contact.

What's really at issue is determining to what standards should licensees and application developers comply? It's an important question—especially to network service providers. Why? "Thin client" technologies, such as Java or Lucent Technologies' Inferno, enable communications applications that, in many implementations, ride on public network infrastructure. No, I'm not talking about an applet that displays an animated graphic on a Web page. I'm referring to the applications that technologies such as Java were really designed for—those that let various clients of varying degrees of processing ability and interface complexity access more powerful computing resources on the far ends of networks. In short, Java and technologies like it are market and technology drivers for better networks and more networks—your networks.

Already, the market for these applications is big and is expected to grow. According to Zona Research (Redwood City, Calif.), the Java market will total over $58 million in 1997 and more than triple by the year 2000, reaching nearly $180 million.

So, does Sun have a legitimate case? For that matter, how critical is it for Java applications to be based on "pure" Java? The former is up to the courts, but as far as the latter is concerned, I believe it's critical to Java's success as not just a thin client technology, but as a catalyst for public network services. However, Java has to be taken to the next level—beyond mere licensing agreements. In other words, it has to be a *de jure*—not a *de facto*—standard.

This seems to be happening. Last March, Sun submitted an application to the International Organization for Standardization/International Electrotechnical Commission Joint Technical Committee 1 (ISO/IEC JTC 1) for Java to become a Publicly Available Specification (PAS). The PAS process is currently developing, but if what Sun's suit alleges is true, actions like Microsoft's won't help.

David C. Kopf

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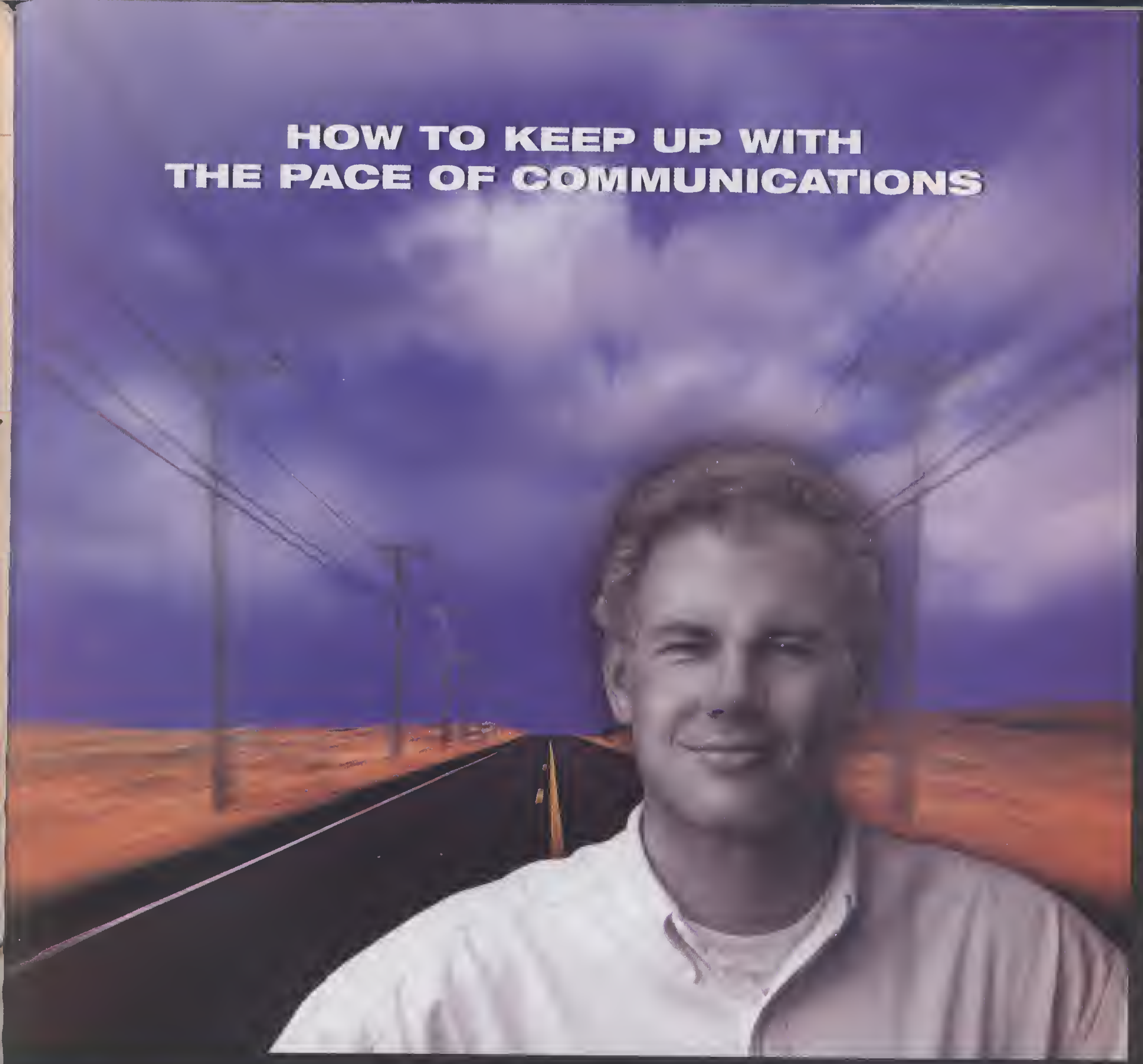

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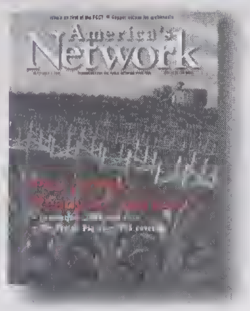
Broadband access bottlenecking



"Uncorking the broadband access bottleneck" (Sept. 1) by contributing editor Alan Stewart gives some brief consideration to the architecture of digital subscriber line access multiplexer (DSLAM)-based solutions and introduced the concept of multiservice host digital terminal (HDT) interconnected by means of OC-3 pipes. One of the dilemmas of broadband access extending out into the existing network with highly dynamic bandwidth requirements is maintaining a cost-effective transmission path providing bandwidth agility as broadband service grows and distributes throughout an essentially tree-and-branch network topology. I would draw your attention to a global initiative called Gx Full Service Access Network (FSAN) which consists of 12 major telcos from three continents and about 17 major telecom vendors who are actively defining an access architecture which includes asynchronous transfer mode passive optical networks (ATM PONs) as the access transmission preferred solution. A web reference can be found at: http://btlabs1.labs.bt.com:80/profsoc/access/index.htm.

Peter Atterton
Manager–Broadband Access Systems
Nortel Ltd.
Harlow, Essex, United Kingdom

Stewart responds: *Thank you for you comments on my article. I agree totally with your comments on the need for cost-effective provision of dynamic bandwidth support for the multimedia services in the current tree-and-branch access network.*

The long-term solution is to replace this legacy architecture with interlocking Sonet rings and ATM. I have covered this to some extent in previous articles and hope to do so again in the future. I am obliged to you for your reference to the multi-telco global initiative called Gx FSAN and will follow this over the next few weeks. Thanks for your interest.

Helpful FCC information

We are attempting to gather information on how the four Federal Communications Commission nominees will, if confirmed, influence the decisions of the commission. I have been asked to put together a bibliography of papers, speeches, etc. However, I've had difficulty locating that information through regular online search methods.

The feature, "Who's on first at the FCC?" (Sept. 1) provided more information than I have been able to locate elsewhere.

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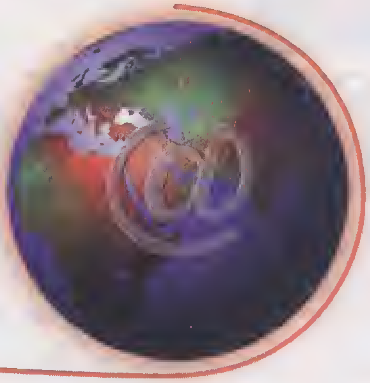

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PAUL BARAN

Ending spectrum shortage

Surplus is not an impossible dream, after all.

One hundred years ago, Marconi demonstrated his radio spark transmitter. His signal spattered the band. Young Marconi was asked, "How could more than one transmitter operate at the same time?" His answer was a technology fix—the resonant tuned circuit.

> **Proper use in a minimally regulated fashion could provide all the spectrum that's needed.**

Radio has had to live with a shortage of frequencies, so the guardians of the spectrum—national governments—parsimoniously doled out these scarce frequencies. Any time you give away a scarce, free good, opportunities for favoritism and graft are unavoidable. Limited spectrum availability forms an ideal mechanism to create and maintain monopolies. To this day, radio spectrum space remains scarce.

Some spectrum is being auctioned at high prices to those that hope to obtain a monopoly position. The early bids were so high that Congress now plans to help balance the budget with the revenues from spectrum auctions. But in the last auction, spectrum went at bargain-basement prices. So, the constituency seeking to maintain the highest possible prices for spectrum includes not only the early bidders but Congress as well. The initial concept of allowing society to make better use of the underutilized spectrum seems to be lost.

In a world of perpetual spectrum shortage, a surplus of frequencies may sound like an impossible dream. So let us consider some technical approaches that could get us there.

USING THE UNUSED SPECTRUM

As an "existence proof" that this may not be totally preposterous, tune a spectrum analyzer across the UHF band (300 MHz to 3,000 MHz—the most valuable portion of the spectrum). You will find the spectrum only lightly occupied. Why is this spectrum so seemingly empty? The reasons are several. What must we do to use this unused spectrum?

Let us start by examining today's conventional analog TV modulation that requires about a 40 dB signal-to-noise ratio to produce a good picture; 40 dB means a factor of 10,000. In other words, all unwanted signals must be kept below one-ten-thousandth the strength of the TV signal. This ratio is equivalent to a maximum of 3 ounces of interference allowed in a ton of signal. So, most of the spectrum must be set aside to protect those few signals that are so vulnerable to interference.

By moving to digital modulation we can get by with only a 25 dB signal-to-noise ratio, or about 15 dB better. This is an improvement by a factor of 30, and allows adding many more stations. The second payoff is that each 6 MHz channel can now carry six times to 10 times as many TV pictures. So we are talking on the order of 200 times to 300 times better utilization.

LARGER BLOCKS OF FREQUENCIES

Another technique for the intermittently needed channel for voice or data is achievable by getting totally away from the concept of assigning narrow slivers of frequencies to specific users solely for specific applications. Larger blocks of frequencies shared make much better use of the spectrum. This is what cellular is all about. Imagine a post office, where one window sells only $0.20 stamps, another only $0.21 cent stamps, etc. You can bet that the window selling $0.32 stamps will have a line in front of it extending out the door, while the other clerks are twiddling their thumbs.

Sounds silly, but this is the way the two-way spectrum has been historically assigned. Cellular systems are homogeneous in that a single system owner is responsible for managing instantaneous frequency assignments. What also is needed is an extended system that does the same for heterogeneous disparate users, without single company control.

Both general techniques are well understood, but their implementation has been painfully slow. There are other tricks, not yet implemented. What we need to implement many of the new tricks and to speed the evolution of known, but underutilized techniques is the software-defined transceiver.

Today's radios are generally single-application only, limited to tuning only a narrow range of frequencies to respond to a single, generally dumb form of modulation. The software-defined transceiver is a small unit having only a few digital chips, but with the power to "morph" itself into any type of transmitter or receiver using any type of modulation, and implement smart interference avoidance techniques. For example, the unit could morph itself into a spectrum analyzer to find unused holes in the spectrum. It could choose the most efficient form of modulation, including error-correction para-

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- 145 ○ Telecommunications Consulting/Engineering Co.
- 135 ○ Construction Contractor
- 152 ○ Telecommunications Equipment Vendor, Reseller, VAR or Distributor
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- H ○ MSO (Two or more Cable TV Systems)
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- K ○ Other Cable
- L ○ Competitive Access Provider (CAP)
- M ○ Telecommunications Reseller
- N ○ Internet Service Provider/Commercial Online Service Co.
- O ○ Systems Integration/Outsourcing
- P ○ Other Carrier
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3. Which of the following describes your title classification? *(Fill in ONE only.)*

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- 12 ○ **Engineering** (Network Designer, Engineer, Technician)
- 25 ○ **Data Communications/Digital/IS/MIS Mgmt.** (Data Communications, Digital, I/S VP, Director or Mgr.)
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- D ○ **Cable/Video/Multimedia Equip./Services** (Headend Equip., Antennas, Switches, Receivers, Studio Equip., Audio Processors, Fiber/Coax Systems, Network Mgmt., Video Servers, Video Operations Support Systems, Set Top Equip.) .
- E ○ **Customer Premises, Broadband Subscriber Equip./Services** (PBXs, Station Equip., ACDs, Videoconferencing, Remote Controls, Converters)
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Sounds silly, but this is the way the two-way spectrum has been historically assigned. Cellular systems are homogeneous in that a single system owner is responsible for managing instantaneous frequency assignments. What also is needed is an extended system that does the same for heterogeneous disparate users, without single company control.

Both general techniques are well understood, but their implementation has been painfully slow. There are other tricks, not yet implemented. What we need to implement many of the new tricks and to speed the evolution of known, but underutilized techniques is the software-defined transceiver.

Today's radios are generally single-application only, limited to tuning only a narrow range of frequencies to respond to a single, generally dumb form of modulation. The software-defined transceiver is a small unit having only a few digital chips, but with the power to "morph" itself into any type of transmitter or receiver using any type of modulation, and implement smart interference avoidance techniques. For example, the unit could morph itself into a spectrum analyzer to find unused holes in the spectrum. It could choose the most efficient form of modulation, including error-correction parameters. It even could modify antenna directivity to avoid co-channel interferers. It could implement sophisticated adaptive-routing doctrines. The components needed to do this are available. We are talking about very powerful, but inexpensive technology—consumer-priced units. With such technology, we will be able to implement a bag of tricks to support orders of magnitude more users within a limited spectrum band.

THE TAIL ENDS OF THE NETWORK

The greatest improvement in spectrum availability will come outside of the wireless path. By this, I mean that radio links generally do not live by themselves, but are the tail ends of a larger wired network. By keeping the tails of the network short, frequency reuse explodes the amount of spectrum available. Shorter radio distances are not as much a constraint as first appears, because the short distance ratio tails connect to terrestrial networks.

The composite, radio-plus-wired network would be capable of delivering megabit rates to homes, institutions and businesses. Such hybrid radio-fiber networks are needed to support the growing demand for Internet-based applications for voice, data and images. This would create a new and far greater communications capability than we have today.

Do we really need tetherless radio tails? Yes, as they are needed to support users and their applications who otherwise would require labor-intensive (and, thus, expensive) in-building and inter-unit wiring. The cost of labor increases with time while the cost of silicon declines.Today, we have the component technology that could provide each person with their own individual, tetherless, high-data-rate access to communicate anywhere, anytime in whatever manner desired, including voice, data and image. Proper use of the spectrum in a minimally regulated fashion could provide all the spectrum needed for this new capability.

The common belief that there is not enough spectrum space, and that there will never be enough for these applications and others, is likely dead wrong. Even today, major chunks of the spectrum, I believe, could be made available to all on a totally unregulated basis, using software-defined transceivers. ■

Paul Baran is founder and chairman of Com21 Inc., which produces asynchronous transfer mode (ATM)-based cable modems, and chairman of Aloha Networks, which is developing spread Aloha radio technology. Baran is known as the "father" of packet switching, resulting from a series of reports on packet switching concepts he authored for Rand Corp. In 1964. He has founded numerous companies and organizations, including the Institute for the Future, Cabledata Associates, Packet Technologies, Metricom and Intertax. This article is from a speech delivered by Baran at The Telecosm Conference, held in September in Palm Springs, Fla. (Baran's photo courtesy Louis Bacharach.)

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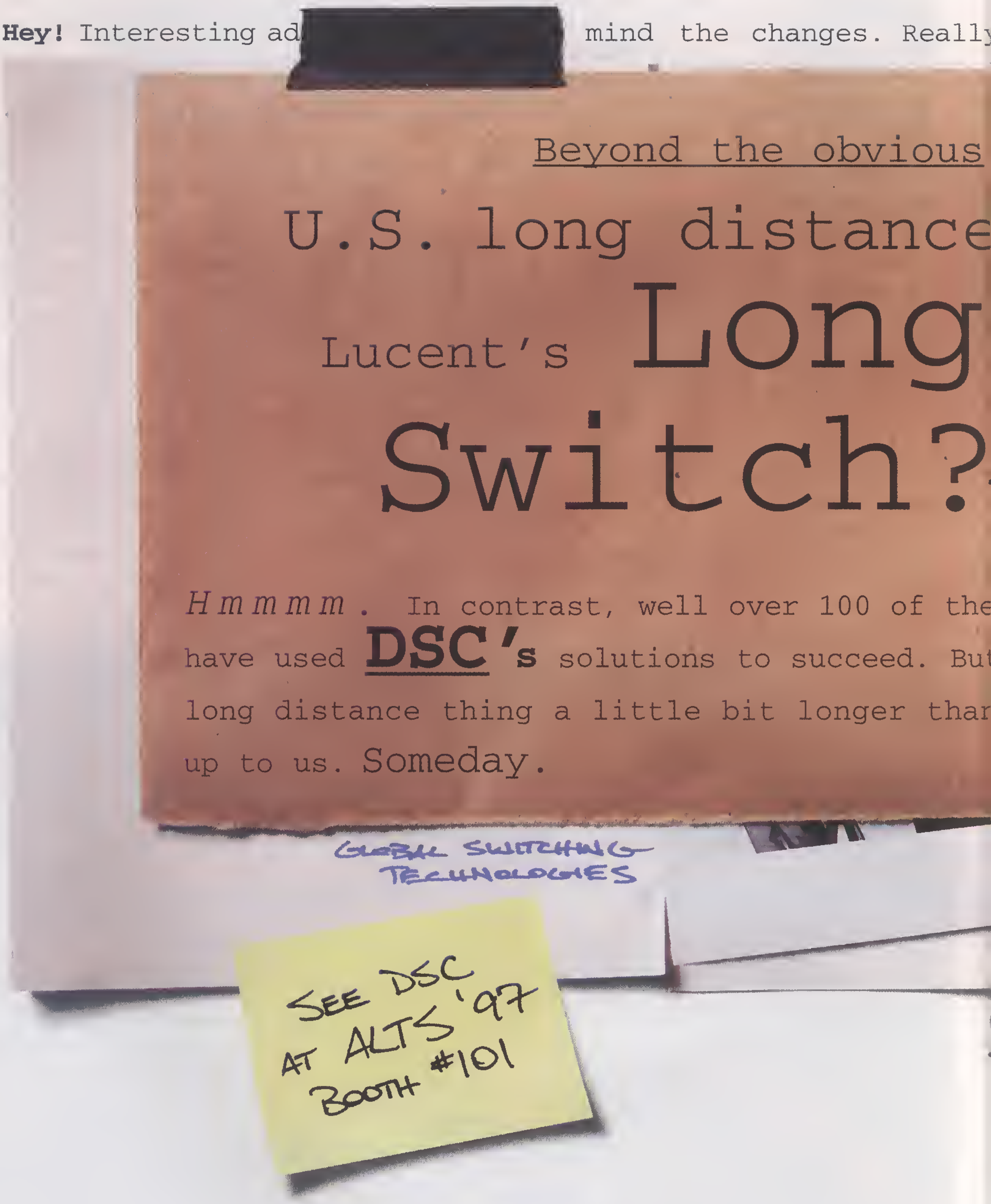

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Circle 105

CHARLES MASON

Long-haul technology vendors target LECs

Manufacturers are struggling to meet 'insatiable' demands for WDM and DWDM transmission equipment.

Driven by the "insatiable" demand for greater bandwidth, the market for optical switching and transmission equipment is growing by leaps and bounds, according to industry executives and analysts.

"All of the carriers at every level are telling us that the demand for bandwidth is absolutely insatiable," says Mike Unger, group vice president of Transport Networks at Nortel.

GROWING NEED TO MUX FIBER

Some of the greatest growth should appear in the market for wavelength division multiplexing (WDM) and dense wave length division multiplexing (DWDM) transmission equipment, according to industry vendors and analysts.

Unger says demand for his company's WDM products has gone from "nowhere to $280 million. Our greatest challenge now is not in marketing, but in meeting demand," he says.

Unger and other vendors say the drive for capacity gains comes as all carriers demand greater cost-effectiveness per bit of data transported. "Nineteen months ago, analysts were saying they thought four- and eight-channel WDMs would be enough for the foreseeable future," says Steve Chaddick, senior vice president of products and technologies for Ciena Corp. "The 'foreseeable future' turned out to be about three months."

A major impetus behind the growth of WDM will come from local exchange carriers (LECs) and other users of short-haul transport, according to analysts. In a study by Ryan-Hankin-Kent Inc. (San Francisco), the market for WDM transmission equipment is projected to soar from $1.6 billion to $4.4 billion by 2001. Senior analyst Mathew Steinberg says that up to half of that will be used in metropolitan environments. Because of several factors, LECs are demanding technology and equipment that previously was sold primarily to long-haul carriers.

LECs are increasingly faced with problems associated with fiber exhaust, says John Ryan, a principal at Ryan-Hankin-Kent and co-author of a recent report on DWDM markets. "Until now, DWDM has not been an option, because the price points of products designed for long distance applications have been prohibitive when applied on shorter links," he says. "Our analysis now shows that DWDM can be economical at lower speeds and over shorter distances."

Steinberg says incumbent LEC (ILEC) and competitive LEC (CLEC) offerings are in line with cost-reduction guidelines that his firm identified and modeled in its recent STAR VI Photonic Networks report. He notes that two varieties of LEC and CLEC products were shown during the recent National Fiber Optic Engineers Conference (NFOEC) in San Diego: point-to-point, focusing primarily on the interoffice segment; and ring, focusing on business access.

HOW DWDM, WDM WORK

DWDM is a technology that allows multiple information streams to be transmitted simultaneously over a single fiber at data rates as high as the fiber plant will allow (e.g. 2.4 Gbps). The DWDM approach multiplies the simple 2.4 Gbps system by up to 16 times, giving a large, immediate increase in capacity using embedded fiber.

A 16-channel system supports 40 Gbps in each direction over a fiber pair, while a 40-channel system will support 100 Gbps, the equivalent of 10 STM-64/OC-192 transmitters. According to Ryan, the benefits of DWDM over the first two options—adding fiber plant or deploying STM-64/OC-192—for increasing capacity are clear.

DWDM uses a composite optical signal carrying multiple information streams, each transmitted on a distinct optical wavelength. Although Ryan-Hankin-Kent points out that WDM is a known technology, its early application was restricted to providing two widely separated wideband wavelengths, or to manufacturing components that separated up to four channels. The technology has since evolved to the point that parallel wavelengths can be densely packed and integrated into a transmission system, with multiple, simultaneous, extremely high-frequency signals in the

192 THz to 200 THz range. By conforming to the International Telecommunication Union (ITU) channel plan, such a system ensures interoperability with other equipment and allows service providers to be well positioned to deploy optical solutions throughout their networks. The 16-channel system provides a virtual 16-fiber cable, with each frequency channel serving as a unique STM-16/OC-48 carrier.

RAPID MARKET CHANGE

The pace of change and developing trends are causing some to dramatically alter earlier projections and estimates of the market—estimates that were made only months ago.

For example, instead of projecting that the market for WDM equipment will increase to $2.4 billion by 2006, IGI Consulting Inc. (Boston) now says that level of spending will be reached in 2000. The number of vendors supplying such equipment will continue to increase to meet the demand.

While not addressing the merits of any particular technology, John Flower, director of dedicated services for SBC Corp., says it's obvious the LECs are intensely interested in anything that will increase capacity over existing plant.

"Historically, you can see this is the trend that we follow," he says. "Assuming that the technology works as advertised and is affordable, we are going to buy it."

The interest in WDM and DWDM technology was evident at NFOEC. Several major vendors announced new products and enhancements designed to take advantage of the surge in interest and demand.

Steinberg notes that the six largest long distance carriers have committed to WDM, and all major vendors have contracts.

Ciena Corp. is one of the companies benefiting from the boost in demand for WDM equipment. As part of its strategy, the company is targeting the short-haul market. "We see the metro market as growing into half of the overall market," Chaddick says.

During NFOEC, Ciena announced MultiWave Firefly, a new product designed for point-to-point, short-haul applications in the public network, and MultiWave Metro, a product in development for ring-based metropolitan network applications.

> **Carriers, especially at the local level, are looking for ways to avoid investing in more fiber.**
> **— Steve Chaddick, Ciena**

"Carriers, especially at the local level, are looking for ways to avoid investing in more fiber," Chaddick says. "Fiber exhaust is becoming a major problem. Anything that can increase capacity of existing plant is drawing a lot of interest."

There also is a market among CLECs for new, bandwidth expanding technology. "Anything that can help them get into the market more quickly is of interest," he explains.

MultiWave Metro will give service providers the flexibility to add bandwidth where and when it is needed, especially for flexible provisioning of high-capacity services in the local loop, he says.

SIF demo successful in sunny San Diego

The Sonet Interoperability Forum upped the ante at the recent National Fiber Optic Engineer's Conference in San Diego by adding an additional ring joined by a digital cross-connect to last Supercomm's synchronous optical network (Sonet) demonstration network. The successful demo incorporated commercially available products that were tweaked to interoperate with one another. The problem for carriers is that those tweaks have not been integrated into available product, yet. Although the demo was successful, the work's not done. Don Thorp, SIF chair and manager of Sonet network platforms for Ameritech sent out a plea for subject matter experts from the vendor community to get involved in SIF's projects. There is a special need for information modellers, he noted. Bottom-line pressures kept two vendors, whom Thorp declined to identify, from participating in SIF's NFOEC '97 demo.

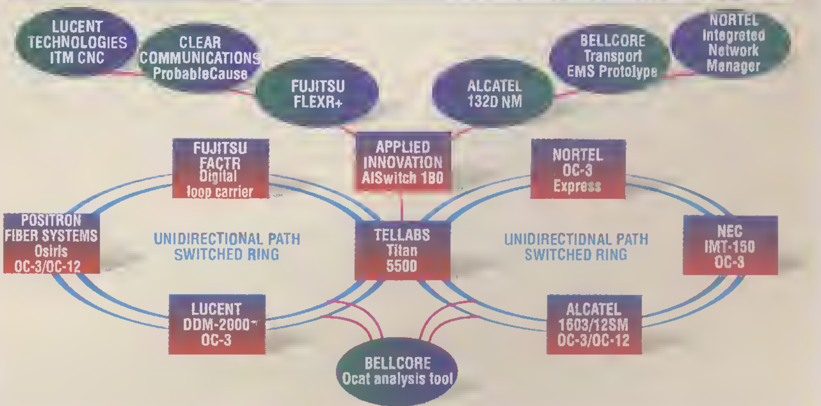
It may get even harder to sit on the sidelines, however. Thorp says one Bell company (whom he also chose not to identify) recently issued a request for proposals calling for products that offered the interoperability shown at by SIF at its Supercomm '97 demo.

If given the choice between seeing vendors get involved in putting up SIF demos or working on providing products with capabilities that have been proven to date, Thorp says he'd "rather see vendors produce the basic system we have on display here, but I don't want to place that kind of limitation on the process."

The process has sparked some vendors to begin to work with each other on their own, he says.

—Annie Lindstrom

The Sonet Interoperability Forum's demo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ALCATEL 1603/12SM OC-3/OC-12
BELLCORE Ocat analysis tool

Source: The Sonet Interoperability Forum

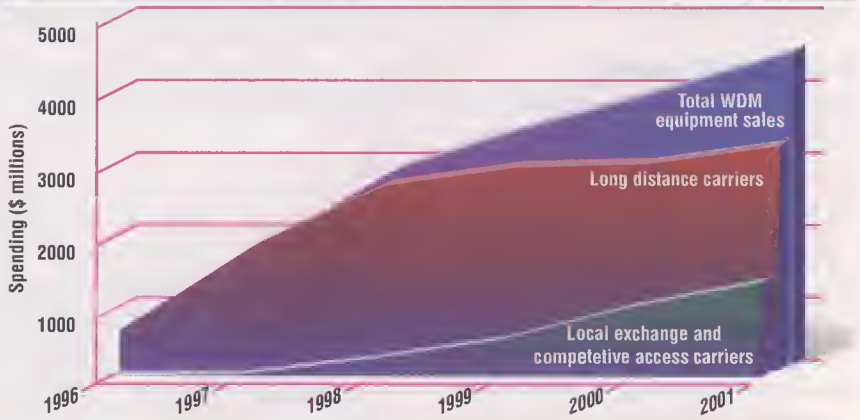
Rapid growth of the Internet and other data applications has fueled increased traffic and demand for bandwidth in the local loop, creating the need for high-bandwidth connectivity between enterprise facilities and public networks, Chaddick says. Ciena has had to design systems that would be economical for these types of applications.

The company's MultiWave Firefly DWDM transport system operates point-to-point without amplifiers in routes of up to 65 kilometers. The system multiplexes up to 24 discrete optical channels operating at 2.5 Gbps over one fiber pair, allowing network operators to provision, on a channel-by-channel basis, up to a maximum of 60 Gbps of traffic on a fiber link.

Chaddick says Firefly is capable of interfacing with traditional Synchronous Optical Network /Synchronous Digital Hierarchy (Sonet/SDH) equipment or directly with devices carrying Asynchronous Transfer Mode (ATM) or fast Internet Protocol (IP) traffic. This interoperability eliminates the need for Sonet multiplexers as interface devices between ATM or IP networks and the transport equipment, thereby simplifying the network and reducing cost.

MultiWave Metro, currently under development, is a ring-based metropolitan network system using DWDM technology with as many as 16 different wavelengths. Metro is intended to provide a cost-effective, modularly expandable network to deliver high bandwidth to end customers, according to Chaddick. "We're targeting

Sales of WDM transmission equipment to North American telephone carriers



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interoffice rings and high-bandwidth, local loop services," he says.

Metro is designed to provide high aggregate bandwidth capacity for multiple applications and data rates.

The product is expected to aggregate multiple traffic types simultaneously, including Sonet/SDH (at Sonet OC-12 and OC-48 levels and SDH rates of STM-4 and STM-16), ATM and fast IP in a ring environment, providing network survivability and the ability to add or drop traffic at various locations around the ring.

Ericsson is also targeting the market with its Ericsson Optical Network (Erion) product line.

According to Rob Batchellor, WDM solutions expert at Ericsson, the system provides a complete solution for the metro market. British Telecom has agreed to deploy Erion systems next spring.

Jose Daza, Ericsson's business development director, says one important feature of the Erion family, optical protection switching, automatically restores service in the event of failures such as cable breaks.

Metro is designed to provide high aggregate bandwidth capacity for multiple applications and data rates.

Daza says DWDM offers carriers of various sizes a practical and cost-effective way of meeting capacity requirements.

Lucent Technologies unveiled enhancements to its high-capacity DWDM product line.

The company's Optical Line Solution (OLS) will let service providers transport a wide range of services, such as voice, video and data, with the same circuit pack over the same fiber, according to Scott Grout, vice president of Lucent's Sonet and Optical Networking business. Alcatel is also moving on the metro front.

Earlier this summer, LCI announced that it would buy WDM and OC-192 equipment from Alcatel. The company at NFOEC announced the availability of its Optinex Local Exchange Terminal (LXT) configuration in its product line.

According to Krish Prabhu, CEO of Alcatel Network Systems Inc., the LXT is designed to offer a lower-cost alternative to addressing fiber congestion in regional and metro applications.

The system allows up to 16 channels of OC-48 and OC-192 for maximum throughput of 160 Gbps on a single fiber strand, according to Tim Krause, senior director of marketing and business development at Optical Networks.

Among companies adding more channels and higher speeds to their long-haul offerings is Fujitsu. The company will offer 32 wavelengths at 10 Gbps, available in the first half of 1998. ■

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BROADBAND Notebook

CHARLES MASON

CATV INTEROPERABILITY GETS A BOOST FROM STANDARDS MOVE

NextLevel Systems Inc.'s Broadband Networks Group and **Scientific-Atlanta Inc.** have inked a deal to cooperate on security and access control technology.

Through what is being called the "Harmony" platform, the two companies will cross-license technology royalty-free. In keeping with last year's move by **Cable Television Laboratories**, they will work together to provide cable TV operators with products that are developed based on a common set of agreed-upon standards.

The goal, according to the companies, is the acceleration of the deployment of digital broadband equipment and services.

The agreement marks a crucial milestone in the development of common interface standards, as first announced by CableLabs a year ago. Members of CableLabs reached an agreement on aspects of an interoperable digital cable systems specification in October 1996.

The goal has been to ensure that set-top boxes and data modems work together. The new specifications outline standards for how cable television systems will transport digital video and data in the existing 6 MHz cable channels.

Among other issues, the payload data rate has been set between 27 Mbps and 40 Mbps. Among the guidelines developed was the provision that downstream digital modulation will conform to the International Telecommunications Union standard ITU-T J.83 Annex B, which calls for 64 and 256 quadrature amplitude modulation (QAM) with concatenated trellis coded modulation. Using 64 QAM, a cable channel that today carries one analog video channel could carry 27 Mbps of information, or enough for multiple video programs. Using 256 QAM, the standard 6 MHz cable channel would carry 40 Mbps. For the DigiCipher and PowerKEY security and access control systems used by NextLevel and Scientific-Atlanta respectively to co-reside on an operator's network, both companies agreed to utilize NextLevel's implementation of the federally published core data encryption standard (DES).

According to a spokesman for the two companies, by implementing common core encryption, operators will not have to duplicate the transmission of programming and related content to implement dual conditional access. While operators would still need to maintain separate headend control systems to control each supplier's set-top terminals, the conditional access data for both DigiCipher and PowerKEY systems can be carried in a single unified bit stream.

Both companies will produce products based on a set of five open standards including MPEG-2 video, Dolby Digital audio, MPEG-2 transport, ATSC system information, and ITU-J83B modulation. All Harmony specifications have been endorsed by CableLabs, and most have been adopted as digital standards by the Society of Cable Telecommunications Engineers (SCTE), an ANSI-certified standards body.

HYBRID NETWORK DEVELOPMENT

The world of hybrid fiber-coax remains an active area for vendors. **Philips Semiconductors** introduced three products for CATV distribution system applications.

The BGY67BO optical receiver module replaces complex discrete component designs with a single-module solution in a standard SOT115 CATV amplifier package.

The BGD702D and BGD804 enhanced-performance amplifier modules for use in the forward path of 750 MHz and 860 MHz CATV networks minimize problems and costs associated with the expanding length and complexity of coax-based CATV networks.

The BGY67BO optical receiver module, a single-module solution, paves the way for the two-way hybrid fiber-coax CATV networks required for interactive applications such as Internet service, home shopping and pay-per-view TV. Philips says previous solutions to the fiber-coax interface in the return path have been complex discrete component designs that are costly to produce and difficult to set up. Selling points, of the BGY67BO optical receiver according to Philips, include linearity, good frequency flatness and a low noise figure, resulting in a high-integrity return path for fiber-based interactive CATV systems.

The system operates from a standard 24-volt CATV network supply and is fitted with a 1-meter long fiber tail suitable for use at optical wavelengths between 1290 nm and 1,600 nm.

The BGD702D and BGD804, enhanced-performance amplifier modules for 750 MHz and 860 MHz, are being touted by Philips as offering a "unique combination of high-gain, excellent linearity and low power consumption."

According to Philips executives, these features minimize costs associated with coax-based CATV networks' need to maintain good picture quality by deploying closely spaced repeater amplifiers, which consume significant amounts of DC power and escalate operating costs.

Used as a pin-compatible plug-in replacement, it improves picture quality on existing networks. In new networks fewer repeaters are needed with BGD702, with consequent savings in network power consumption. The BGD702D may be used as a laser driver in fiber networks.

Philips says the BGD804 meets the high power gain requirement with excellent linearity up to 860 MHz, yet consumes no more DC power. For the new generation of CATV networks that carry over 100 TV channels, BGD804 offers a significant reduction in the number of repeater amplifiers required.

NORTEL AND ILOG

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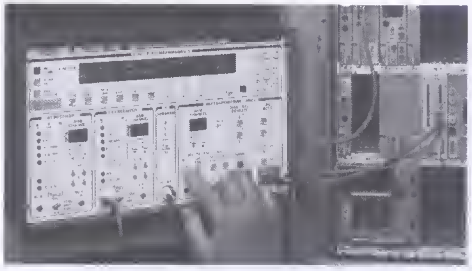

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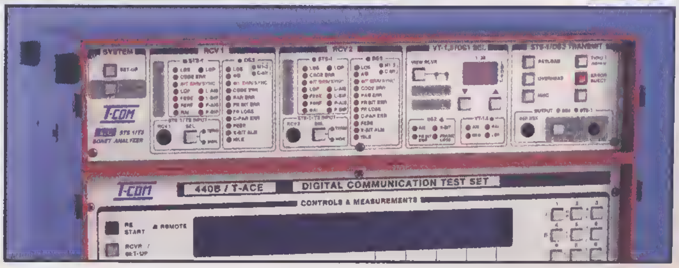

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Philips says the BGD804 meets the high power gain requirement with excellent linearity up to 860 MHz, yet consumes no more DC power. For the new generation of CATV networks that carry over 100 TV channels, BGD804 offers a significant reduction in the number of repeater amplifiers required.

NORTEL AND ILOG

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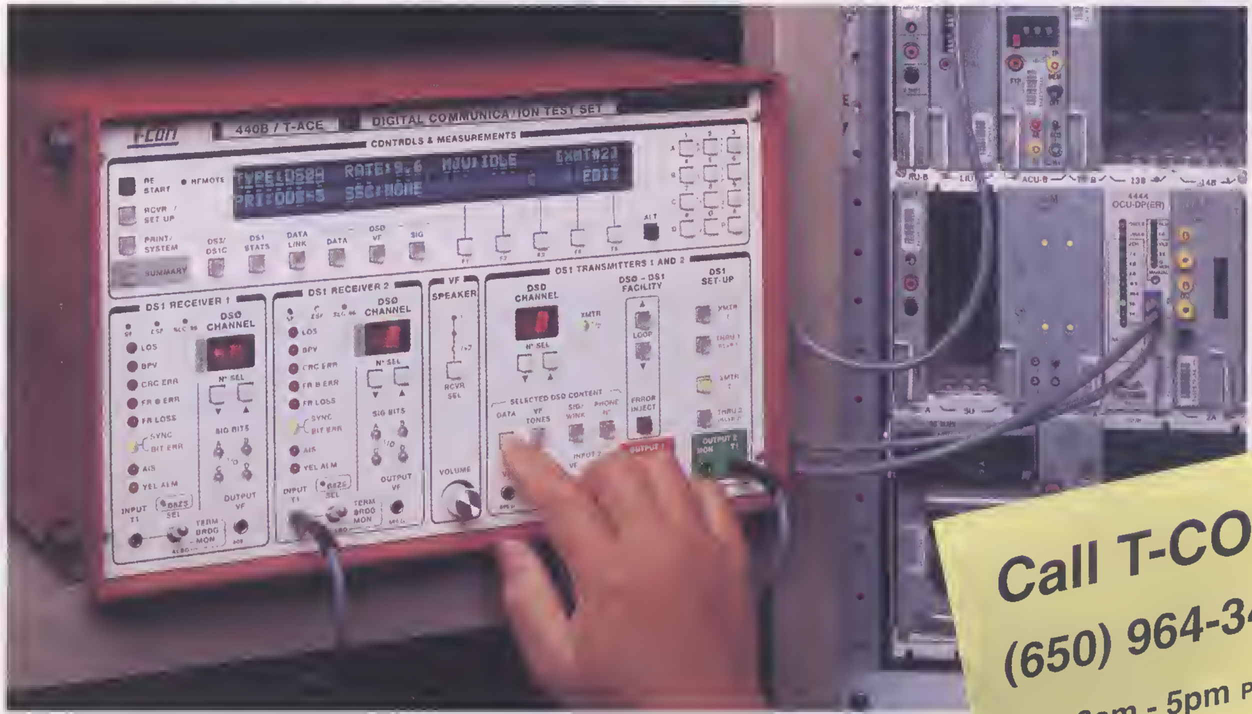

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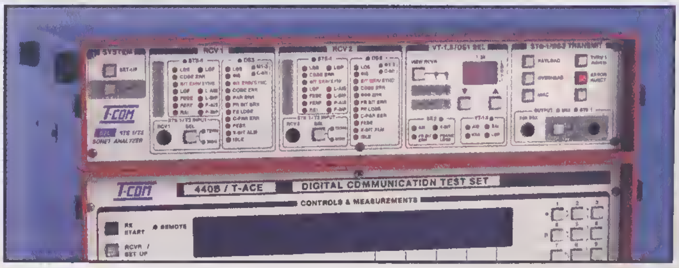

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Paging FLEXes its muscle

Market revs up telemetry applications.

In the fray of personal communications services (PCS) and digital cellular growth, the surprise wireless story of the year may be paging. By 2001, paging revenues will climb to $10 billion—more than double the subscriber revenue of today, according to Insight Research Corp. (Parsippany, N.J.).

The Strategis Group (Washington, D.C.) reports that paging carriers added 8.6 million new subscribers in 1996—exceeding all projections and total 1995 growth. In certain Asia-Pacific markets, penetration rates for paging are above 20%—astonishing, given that 60% of the world's population is concentrated in that region. Equipment suppliers such as Motorola say they are "bullish" on paging. With annual U.S. growth rates of 20% and more a year, how could anyone be wrong?

Paging offers psychological advantages in an era of information assault, where there are too many faxes and phone calls, and too much disruptive and distracting conversation, says David Hughes, corporate vice president and general manager at Motorola's Paging Systems Division (Ft. Worth, Texas). "If you're a business user, there's certainly a need for real-time communication [such as PCS]," he says, "but if you want to get information, there are also occasions when you don't need it immediately." A delay of just a few seconds—the time it takes to transmit or receive a page—may be the "space cushion" that harried business and residential consumers need to process information, prioritize it and take control, he says.

A new message can be received on a pager, read on the pager, and responded to when the user is ready. "It's much less disruptive than a phone call and listening to a voice," Hughes says. Using a two-way pager while away from the office, "I can send [a request for information] to my secretary, and two minutes later, I get a response. I see the utility in paging [in] being able to send and receive information in [near-real time]."

The global appetite for paging services affirms this view. Paging carriers and equipment suppliers are targeting the youth market with "one-and-one-half way" paging. This combines acknowledgment or confirmation messaging, pure voice paging ("an answering machine in a pocket"), text-to-voice paging (in which messages are translated into digitized voice), guaranteed message delivery, and forms of two-way data, text and, ultimately, image messaging. Supporting this is new network infrastructure; notably, Motorola's FLEX (one-way), ReFLEX (two-way) and, most recently, InFLEXion (voice paging) protocols, all of which are rapidly replacing the old POCSAG standard (originated for paging by the British

Post Office) with much nimbler two-way transmission systems, frequency reuse and capacity gains.

In addition, paging suppliers are pushing entirely new applications, which they call "pagers paging things instead of paging people." The opportunities include over-the-air wireless telemetry, utility meter reading, automobile paging systems, industrial controls, automated vending machine inventory control, crime-fighting systems, monitoring devices, and transmission of digital images—all at price points that may prove as or more attractive than broadband PCS and cellular network capacity.

"If paging carriers want continued growth, they have to get into enhanced services quickly," says Ira Brodsky, principal of DataComm Research (Chesterfield, Mo.). "PCS and digital cellular are a threat, especially as prices come down and messaging services become more robust."

How much of a threat is anyone's guess. Many paging suppliers argue that wireless technology builds on itself—it's synergistic. An entire generation of subscribers now carry pagers on their belts while toting at least one wireless phone in their pockets or cars.

But John Zahurancik, a consultant with The Strategis Group, cautions that paging may reach saturation levels within five years or more. "PCS is the million-dollar question now for the paging industry," he says. "We should still see substantial paging growth for the next five years, but we forecast a slowing of paging and competition from broadband PCS and digital cellular."

Some of the advanced services paging carriers are preparing to offer include two-way text messaging capability on sophisticated alphanumeric pagers that have tiny keyboards. But these services "are pushing up toward PCS and cellular prices," Zahurancik says. "This will play a role in what carriers decide to do; they have to recognize how much they can charge for advanced services—and that's somewhere between basement pricing for simple paging services and [pricing for] two-way PCS voice."

If carriers want continued growth, they have to provide enhanced services quickly.

THE TWO-WAY FLEX

The biggest news in paging is the kick-start of two-way FLEX networks. Carriers are building out two-way networks and layering advanced paging services (such as news and message acknowledgment) on top of them, based on various flavors of the Re-FLEX 25 or Re-FLEX 50 protocols. Both offer enhanced alphanumeric capability, error correction, frequency and geographic reuse, two-way paging and acknowledgment messaging. The original (1993) FLEX protocol was designed for one-way paging systems providing higher speeds and network efficiencies over POCSAG.

The FLEX protocol is used by 16 of 20 major U.S. carriers; more than 30 countries use it, with 21 other nations building out FLEX networks. With FLEX, longer messages are possible and data rates can be as high as 6,400 bps, according to Larry Conlee, corporate vice president and general manager for Motorola's paging systems group. "FLEX is a synchronous protocol… whereas POCSAG is an asynchronous system that started at 512 bps, and moved up to 2,400 bps," he says.

POCSAG was designed for very short messages—principally, numeric paging. FLEX, by contrast, operates at the faster rate, supports alpha messaging and can squeeze more than five times the network capacity, according to Mike Maloney, senior director of product management and marketing at Motorola's Product System Group (Dallas).

Two-way Re-FLEX protocols, which offer varying speeds on the inbound and outbound channels, offer capacity increases over FLEX systems. Re-FLEX enables such services as guaranteed message delivery, allowing subscribers to reply instantly to a message or to initiate a message directly from a two-way paging device. For voice paging, FLEX protocols enable transmission and storage of voice messages, guaranteed message delivery, message-receipt acknowledgment, and reuse of over the air spectrum.

"FLEX can be upward of 6,400 bps on the outbound path," Maloney says. "In Re-FLEX, it can be as low as 800 bps and

The urge to merge

"The industry is seeing a consolidation of the paging base within the top 10 carriers—from Pagenet with its 10 million customers down to AT&T and Mtel (Jackson, Miss.) with just over a million [each]," says Michael Karasinski, paging portfolio manager at Philips Consumer Communications (Irving, Texas).

"More and more subscribers are coming under the top 10 carriers.The large companies are now a much more powerful force than before," he says.

Pagenet is head-and-shoulders above other paging carriers, supporting nearly 10 million customers. A deal is pending between Metrocall (Virginia) and ProNet (Dallas), which could affect 4 million to 5 million subscribers in different market bases.

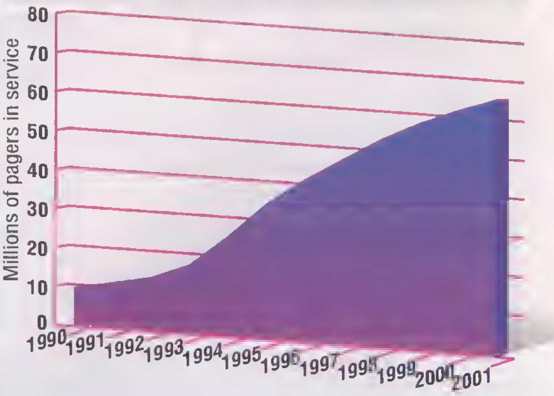
"ProNet subscribers are into numeric paging and large corporate organizations such as the Dallas Health Service, while MetroCall is into a retail market and [is] a bit more alpha base," Karasinski says.

Another large paging company, MobileCom (Ridgefield Park, N.J.), with 4 million subscribers, filed for bankruptcy in February. "A lot of companies have churned off their systems," Karansinki says. "There is also a second tier of paging companies, ranging from 250,000 to 500,000 subscribers. After that are the 'mom-and-pop' shops."

The general industry prediction? More wireless and paging mergers on the horizon. Carriers want to manage what they've got more carefully, Karanski says.

"Everyone needs to keep an eye on market analysis and profitability," he notes. "There's a lot of close scrutiny ahead."

Figure 1: Total pagers in service, 1990 to 2001



Source: The Strategis Group

higher on the inbound path, and up to 19,200 bps on the outbound path."

Mtel (Jackson, Miss.) has optimized the outbound path for interactive messaging to 25,600 bps. "The faster you go, the more sites you need—the pager has a defined sensitivity," Maloney says.

Re-FLEX protocols provide additional capacity through multichannel allocation (up to seven subchannels), cell site reuse and numerous other features. In addition, rather than operate in a nation or region on a single frequency, the new paging systems may operate at more than one frequency in different geographic locations, and then reuse the frequencies.

"We have 10 times' capacity improvements because of geographic reuse and frequency reuse," Conlee says. "With Re-FLEX, not only is the pager more agile in terms of allowing different frequency reuse, it's also part of a registration process. The system can confirm the accuracy of transmission—it measures bit error rate.

"Say, for example, I want to see a message again," Conlee continues. The system "slices the message and sends back the piece of the data packet, so there is communication between the pager and transmitter."

In the traditional paging paradigm, the entire country would be "lit up"—all transmitters operating—as the page weaves toward a subscriber's belt, observes Matthew R. Piette, marketing communications director at Motorola's paging division. "But because of the acknowledgment function in the [new] pagers, the pager is constantly saying 'hi, I'm here.' That sends a signal back to the nearest transmitter. The network can recognize where you are at any one time so you don't have to 'light up' the whole country. That frees up tremendous capacity for the operator."

Boosting single-channel capacity from 600,000 to a current 6 million customers, "we're able to build in capacities that will allow carriers to grow gracefully into alpha messaging," Piette says. "On the voice side, with such paging products as Tenor, we also can get confirmed message delivery. The operator and the user have confidence the message will go through, because the system can find the person who's gone out of a coverage zone."

CARRIER CRUNCH

The carrier crunch is on to deliver these services. "We're seeing a consolidation of the paging market—mergers and acquisitions among the large carriers," as well as fewer opportunities for mom-and-pop shops, observes Michael Karasinski, paging portfolio manager at Philips Consumer Communications (Irving, Texas).

"Paging, along with most wireless communication, is becoming a consumer products industry as opposed to a communications or telecom [industry]," Karasinski says. "We design products that fit into people's lifestyles and with technologies that makes sense." The latter comment could be a euphemism; Karasinski acknowledges that Philips will support advanced paging networks—FLEX, Re-FLEX and others—"as long as the market is there; but some of these concepts, including pager acknowledgment and frequency reuse, are embryonic in terms of their introduction to the market. There are few networks, for example, that support nationwide acknowledgment," he says.

> Paging is becoming a consumer products industry as opposed to a telecom industry.

Large paging networks such as PageNet (Dallas) have had mixed results in offering advanced two-way paging based on voice paging technology (known as VoiceNow). Subscribers are uncertain about the more advanced possibilities.

PageNet and Conxus (Greenville, S.C.) have had aggressive plans to offer the latest in wireless (voice) paging based on Motorola's InFLEXion technology, a 112,000 bps service that allows transmission of voice messages over two-way systems. "PageNet wanted to introduce two-way voice paging around selected markets, but it doesn't seem to be as great a success as it was forecast to be," Karasinski says.

A spokesman for PageNet—the largest paging carrier in the country, with 9.7 million subscribers—agrees. "We're building an inFLEXion two-way network, but it hasn't met our expectations in terms of sale," he says. "We had originally planned to roll out the service nationwide, but right now it's in Dallas, Sacramento and Atlanta. We plan to launch in Chicago.

"We thought we'd be further along," the spokesman continues. "There are significant issues to address—how to position the product; determine its form factor, size and weight; position it relative to PCS—before we make a determination nationwide." PageNet still plans to resell Mtel's two-way Re-FLEX 50 services, according to the spokesman.

Mtel's activities are focused on advanced data paging. In 1995, the company launched SkyWriter, which lets subscribers create and send replies to messages they've received on their pagers as well as receive messages from Internet addresses. Mtel uses the Re-FLEX 50 protocol, has partnered with Motorola and Wireless Access to produce advanced services, and introduced SkyWord Plus, a guaranteed message delivery service offering automatic confirmation.

Mtel soon will offer the PageWriter pager from Motorola, which has a

continued on page 26

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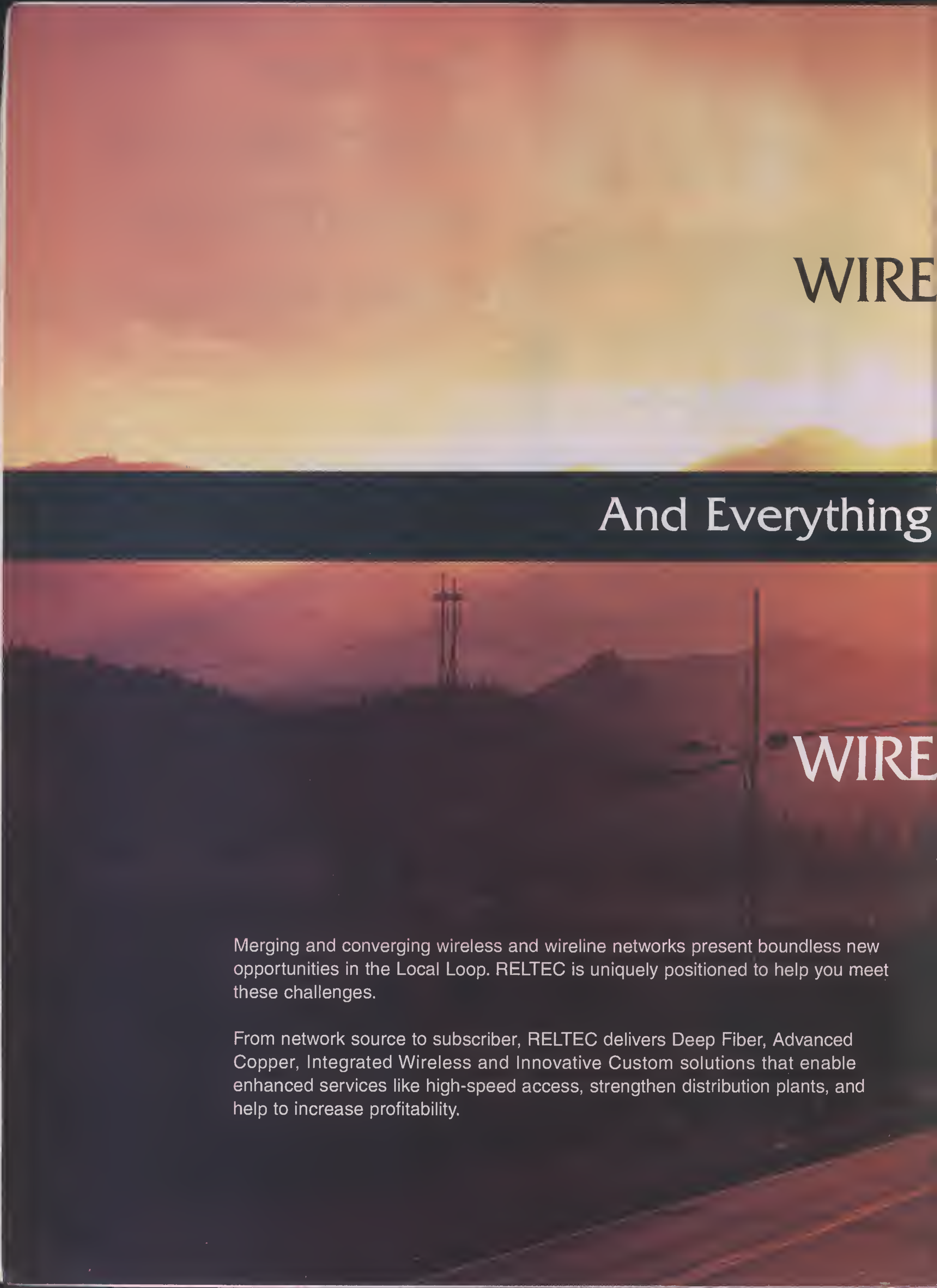

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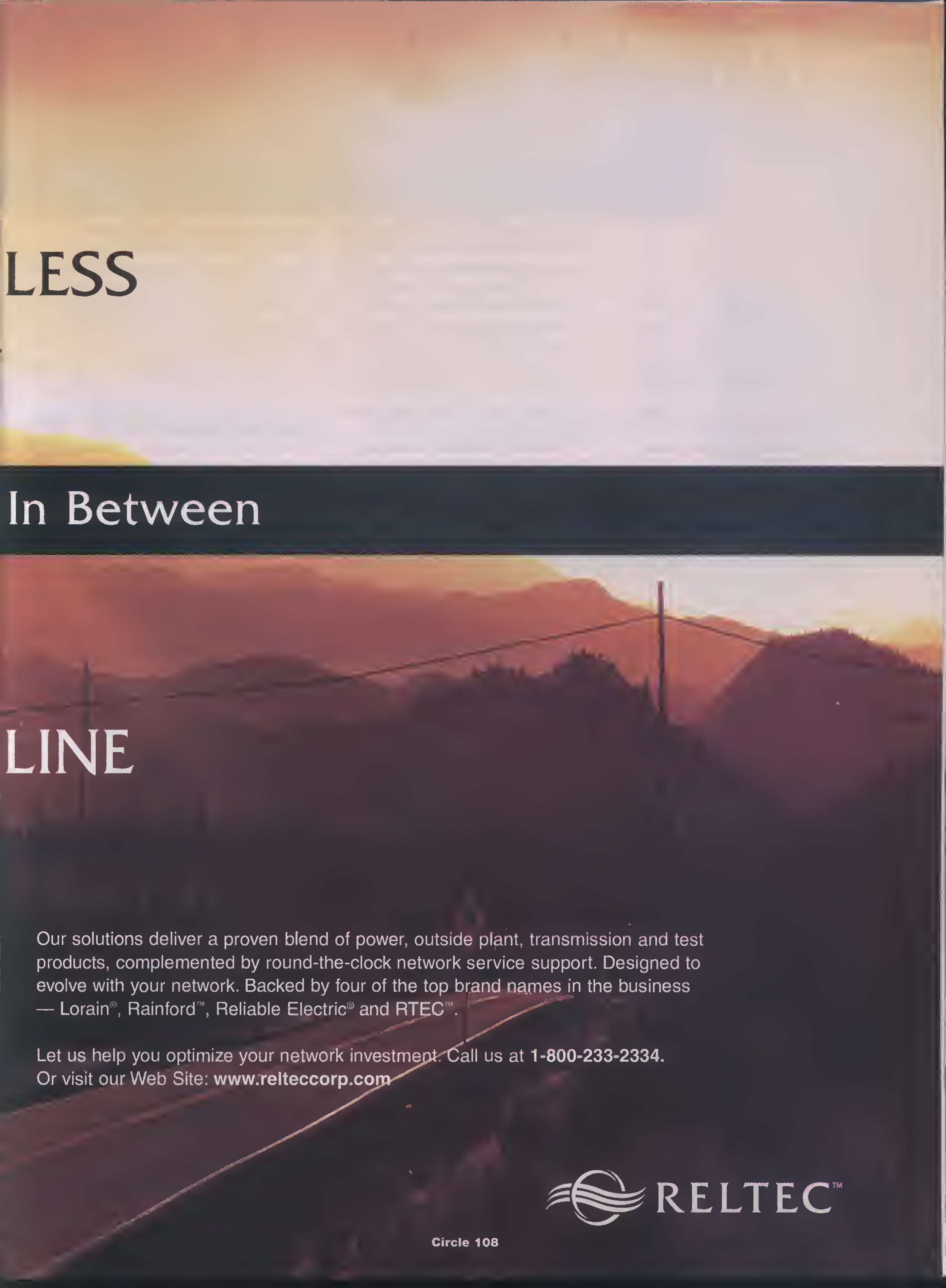

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continued from page 22

miniature keyboard and friendly, agile display capable of full two-way messaging, response and Internet downloads. It will be used in conjunction with the SkyWriter service offered to 120,000 subscribers. PageWriter also has been launched as part of SkyTel service.

Conxus is planning to launch a commercial two-way paging network for voice and data. The company touts Pocketalk, a Motorola-designed answering machine for the pocket; again, the network infrastructure is Motorola's inFLEXion for voice paging. Conxus seems undaunted by PageNet's early (shaky) voice paging experiences.

"We'll be launching over the Washington/Baltimore area and South Florida," says Cecil Duffie, Conxus CEO. "InFLEXion is the highest capacity of any of the two-way protocols for narrowband PCS frequencies, and allows us to do voice and data over a common network." Capabilities include voice, data in text format; alphanumeric paging with guaranteed delivery and error correction; or alphanumeric messaging with brief user-initiated response.

The outlook for voice messaging is upward of 25 million subscribers nationwide.

"Outbound messages to a global subscriber can be up to 500 characters," Duffie says. "We'll offer outbound service first, guaranteed alphanumeric in second quarter '98 and two-way communications by third quarter '98.

"The outlook for voice messaging service is upward of 25 million subscribers nationwide," Duffie continues. "Our planned data service [in 1998] is an enhanced version of what's available today as alphanumeric service over one-way paging networks,. Alphanumeric paging today is about 15% to 20 % of the market. It's part of the fastest growing sector for paging; so we view our company as ideally positioned to enter the market with the highest capacity, two-way messaging network available."

TELEMETRY: THE FUTURE?

Will such optimistic projections hold true? Alphanumeric paging is hot, and two-way skywriting systems are just beginning. Can they find a place that's safe from the PCS/cellular fray and the onslaught of short message services (SMS), wideband Code Division Multiple Access (CDMA), third-generation PCS, local multipoint distribution service (LMDS), microwave, satellite and other solutions?

Motorola's Hughes thinks positively: "The industry has to work out the bugs in two-way paging advanced technology. But, for example, the PageWriter is a ... glitzy device that's utilitarian: it can perform virtually all the basic functions a small laptop could with a word processing or e-mail program and a modem."

Yet, many observers say the true bet is on the applications still to come—*pagers paging things.*

According to Henry Pujol, vice president and director of derivative business for Motorola, vertical market opportunities include:

- Computers—exchanging data with wireless paging networks;
- Automotive—mapping Internet information, remotely monitoring and sensing automotive systems, and even security controls that can warn an errant rental car customer to return the car to the leasing center in a specified number of minutes or risk automatic 'disabling' of the engine;
- Power metering; and
- Automated load shedding.

"Today, most of this kind of metering information is gathered [manually] or through wireline connections," Pujol says, "but by using paging technology, users will receive the information through the air."

Whether you subscribe to CNN or stock quotes, track a stolen computer, or access Internet data, "you'll basically have a pager that sits inside your device [computer, car engine, utility meter, digital scanner]," he says. "This will be more cost-effective and smaller than other solutions." The market for these kinds of solutions could exceed $300 billion, Pujol notes.

For the moment, paging has enormous flexibility and pricing potential, according to Hughes. "The market is looking for a switch from numeric to alpha paging, and I expect to see an expansion of nationwide paging networks," he says. "Also, a number [of public network carriers] are reselling pagers. Public carriers want to offer a range of capabilities. [Services] will come through a reseller agreement or by building their own networks." Some may buy existing paging networks.

Then there's the cost factor. The paging industry, even with advanced services, will be highly competitive.

"There's no doubt that the infrastructure costs are lower and will continue to be lower on a [two-way] paging network than a broadband PCS network optimized for voice," Pujol says. "I think there's a segment of the cost equation that paging is trying to address and that PCS doesn't address. I don't think the PCS operators can get down to the price of paging." ■

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Unwired Planet (Redwood Shores, Calif.) and **Boston Technology** (Wakefield, Mass.) have developed a "visual unified mailbox" on a cell phone.

"You look at a cell phone and see a visual representation of what's in a mailbox," says Joe Hagen, senior business development manager for Boston Technology. "What we've done with voice mail is to evolve the mailbox to become essentially a repository for any message type—voice, fax or e-mail."

The company's Internet-based product, AccessWEB, uses a PC in an Internet connection to look at messages for which have been used historically as a voice interface.

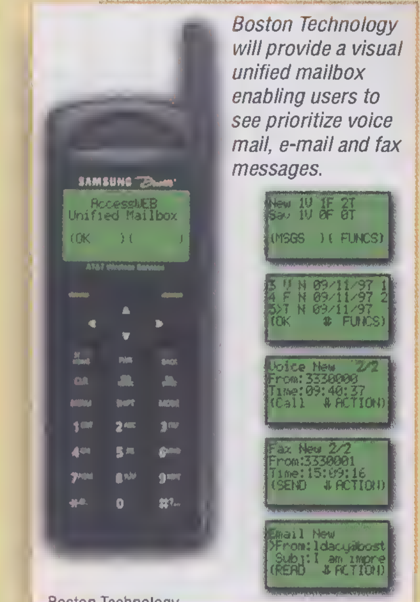
"Now we're working with Unwired Planet ... to extend this into the wireless environment," he says. "[In effect], we have a wireless extension of our unified mailbox; it enables anyone to determine which messages are important and which are not."

The wireless product bowed for its first technology demonstration at PCS '97, according to Hagen, who expects an enthusiastic response from "Unwired" handset vendors. Boston Technology, in business since 1986, already provides voice and Internet messaging systems for the telecom industry worldwide, and recently agreed to supply its Access NP Network Services platforms and software to Panafon, the largest Global System for Mobilization (GSM) wireless operator in Greece. But the Unwired Planet application is the first real foray into mobile messaging interfaces.

The visual interface is one piece of an integrated messaging platform which can use any number of wireless access schemes, including cellular digital packet data (CDPD), Code Division Multiple Access (CDMA), Personal Digital Communication (PDC), GSM and others. AccessWeb permits both audio (voice prompts) and visual prompts with a browser utilizing Unwired Planet's handheld device markup language (HDML) interworking function.

The project, which took three months to complete, lets mobile users access voice, fax or e-mail messages. It is designed for handset independence, and lets users view caller ID, message length, type of message (voice or fax), the status of the message (saved or new), and its priority (normal or urgent).

"We provide a network-based unified mailbox to run on the Access NP part of the platform," says Stewart Hampson, Boston Technology's senior business development manager. "This is a wireless way to get into the unified mailbox using Unwired Planet-enabled phones."



Boston Technology will provide a visual unified mailbox enabling users to see prioritize voice mail, e-mail and fax messages.

Boston Technology

Unwired Planet has many relationships with handset vendors to put micro Web browsers on phone; now they're able to access this unified mailbox, Hampson says.

"It's quite complementary with pagers; in the case of e-mail, you can actually send the e-mail to the phone, and you can store e-mail [or read it]. Wireless messaging is the most used value-added service. In terms of cost, this is a consumer application, and will be targeted at the consumer market," Hampson says.

The system enables the visual mailbox to be displayed on a variety of wireless devices, from personal digital assistants (PDAs) and text browsers to wireless laptops and voice handsets.

PADCOM UNVEILS WIRELESS DATA ROUTING PLATFORM

Padcom, (Bethlehem, Pa.) has announced SmartPath, a platform for routing wireless data for multiple, concurrently operating networks. "This platform overcomes a lot of issues we've seen in wireless data," says Dave Whitmore, Padcom president. "SmartPath isn't a single product, but software and hardware that routes messages over multiple networks dynamically.

"The platform also routes intelligently, choosing the 'best network,'" he says. "In 'back office' networks, for example, routing takes place intelligently by whatever criteria required to decide which network makes sense at any given point in time."

Padcom began in 1989 as a data overlay company, originally providing data over voice for field service personnel in a terminal and applications-independent manner.

The company first developed remote data systems over standard serial interfaces, followed by its own mobile data controller for radio frequency (RF) network. Padcom found, however, that "there were several inhibiting factors stopping people from deploying wireless data," Whitmore says.

The company developed an application called Remote Message to solve the routing problem. It also developed government Transmission Control Protocol/Internet Program (TCP/ IP) protocols over RF networks which led to product development for SmartPath—a platform that overcomes a lot of routing and intelligent data-handling issues.

Residing on an Intel Pentium server running Unix, the Padcom platform employs a remote router—an intelligent device connected to a computer using industry-standard interfaces and point-to-point protocols. "The routing solution has tremendous power," Whitmore says. "It can provide reliable, redundant paths, so even if the network fails, you can go to a secondary or tertiary network.

"A lot of these customers find that single network technology does not resolve their needs."

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CHECKING OUT CARRIER HOTELS

Space ... a fading frontier for carriers.

Ask 20 different people what a carrier hotel is and you'll get 20 different answers. The one thing these buildings do have in common, however, is that their owners have discovered that catering to the needs of electronic, rather than human, tenants can be highly profitable. And, although they are called "hotels," the "guests" usually check in for good, and they have special needs.

In its narrowest definition, a carrier hotel is a building in which interexchange carriers (IXCs), who buy and resell each others' services, co-locate their points of presence (POPs). By co-locating, they can use premises-based cabling to interconnect with one another and thereby avoid the cost of a high-bandwidth connection provided by a local exchange carrier (LEC).

Not just any old proprietor can construct a carrier hotel in any old building. Building owners must offer their electro-mechanical tenants plenty of air conditioning, uninterruptible power and battery backup. They also must provide raised floors or risers, and ducts that will accommodate the fiber optic and copper cable the tenants need to run throughout the building to interconnect with each others' equipment. Security is another important amenity—especially as the number of carriers located at one property increases.

As more IXCs congregate in the same building, the carrier hotel becomes an attractive place for incumbent and competitive local exchange carriers (ILECs and CLECs) to take up residence. It is convenient for them to be on the premises because they can easily connect with, and hand off traffic to, the IXCs and each other. As traffic on Internet service provider (ISP) networks increases, they are starting to pop up at these carrier hotels, too.

The most well-known carrier hotels in America are located at 60 Hudson St. in Manhattan and One Wilshire Blvd. in Los Angeles, where 27 providers have checked in to date. The high concentration of service providers in one building has contributed to the need for more carrier hotels for diversity's sake.

"A lot of carriers are starting to put two pops in each LATA [local area transport area] to get around the security issue," says Steve Nocella, manager of network planning for Teleport Communications Group (Staten Island, N.Y.).

SUPERIOR TO THE CO?

Large CLECs disagree with reports that they view carrier hotels as a desirable alternative to physical or virtual co-location in an ILEC central office (CO). Although they do locate facilities in carrier hotels, they do not do so in lieu of space in the CO, but in addition to it—at least not while space in the CO is still available, anyway.

"We make every effort to always co-locate in strategic COs to best serve our customers," says Bill Karambelas, vice president and general manager of CLEC GST Telecom California. "If I have a customer base in a certain part of greater Los Angeles, I'll make an attempt to extend fiber out to that serving CO in order to provide as much of my service over the GST infrastructure and as little over the ILEC's as possible. In some cases, I extend fiber to the customer's building."

Locating facilities in carrier hotels is not without reward, however, especially in hotels where other service providers, who are also customers, are located.

A NEW TWIST

Space in an ILEC or CLEC CO or an interexchange carrier's POP is expensive and equipment that is to be co-located often must be able to meet stringent criteria to be housed there. In addition, co-locators often must be able to guarantee that a certain level of traffic will be exchanged with the host of the facility to gain admittance. Although this is less of a problem for larger CLECs and ISPs, small-to medium-sized players can be left out in the cold.

That's where a new twist in the carrier hotel concept is catching on. Telehouse International Corp. of America (Staten Island, N.Y.) has two floors in two different buildings in the Wall Street area (the exact location of which cannot be disclosed due to security reasons) where its clients—international and domestic ISPs, callback companies, overseas long distance carriers, heavy data users—can connect their modem pools, voice or data switches, or transmission gear to the local loop by running cable underneath the raised floors into a room containing transmission equipment belonging to Bell Atlantic and several CLECs (one of which is a wireless provider).

"This appears to be a sophisticated and timely innovation of the concept of a carrier hotel," says Philip Nyborg, president of InterSwitch Inc. (Oakton, Va.)

Unlike a traditional carrier hotel, however, the LECs that reside at Telehouse America's properties are not on site to interconnect to one anothers' networks. They are there to provide local loop connectivity to Telehouse America's clients. Any interconnection between carriers occurs at 60 Hudson St., which is only a short distance away from both Telehouse America sites.

Telehouse America's clients buy space in a room just across the hall from a room containing the LECs' facilities, so they are not charged the price of a local loop. However, the carriers levee port charges for access to their transmission equipment. Because Telehouse America is a "carrier neutral" facility, however, its clients don't have to promise any carrier a specific amount of traffic to purchase floor space for their equipment, nor do they have to exchange all of their traffic with a single carrier.

"We sell floor tile," says Richard Mataka, deputy director of sales and marketing for Telehouse America, whose primary owner is Japan's KDD. "Along with the floor space, we provide first level operations support to our clients. That means we touch the equipment on their behalf and troubleshoot problems for them with the different carriers when something goes wrong. We also do equipment hot swaps for them. The level of support is tailored to their requirements."

Telehouse America charges clients $800 per month for floor space and support required to accommodate one 78-inch. high, 24-inch wide, 29-inch deep rack. Space for a second rack costs $700, three to five racks cost $550 each, and each additional rack thereafter costs $520. Mataka declined to reveal the price of floor space for carriers.

Unlike a traditional carrier hotel, however, the LECs that reside at Telehouse America's properties are not on site to interconnect to one anothers' networks.

In addition to providing its ISP clients with local connectivity, Telehouse America has established the New York International Internet Exchange (NY IIX). The NY IIX is a centralized, provider neutral, high-speed Ethernet switch allowing Telehouse America's ISP customers to establish peering or gateway interconnects with one another. This ability to team-up with each other at the same site gives Telehouse America's clients an efficient and cost-effective means of enhancing the quality and responsiveness of their backbone networks.

"Things have been extremely hectic for over a year for us," Mataka notes. "A lot of it has had to do with the Internet. Telehouse has the highest concentration of international Internet companies co-locating at a single facility in the U.S."

Telehouse America's clients buy space by the floor tile in a room just across the hall from the local exchange carriers' fiber facilities.

Telehouse America

GETTING INTO THE BUSINESS

Ed Doyne, building manager for a Washington state property management firm that leases space in a carrier hotel in Seattle, believes they evolve by "happenstance." If at least two carriers locate facilities in the same building and others decide they want to be near them, and if the building owner is able to accommodate their needs, a carrier hotel evolves.

"Some property management companies don't understand the telecom business and don't see the asset they have," Doyne says. In Doyne's case, he and the building's electrician thought they ought to check out a new "niche market" for telecommunications tenants after responding to several of the building's "regular" tenants' requests for assistance with their communications needs.

Today, a total of 77 telecom carriers, ISPs, and other types of service providers have floors filled with facilities, which are interspersed among the regular tenants of the 30-story office building that Doyne manages. Only carriers that are tenants in the building are allowed to put up interconnection panels and digital cross-connects in what Doyne calls the "meet-me-room" in the middle of the building.

"We put in a riser system that gives us the ability to run cable throughout the building and focused it into the meet-me-room," Doyne says. "We have conduit that runs in the corners of stairwells and we put holes in the floors of what used to be janitors' closets and put the janitors somewhere else. We shrunk the sides of the elevator lobbies by 6 inches or 8 inches to run cable down the lobbies. But we still maintain an image as a Class A office building."

Needless to say, space is cheaper in Seattle than it is in New York. Tenants who rent more than 1,000 square feet of space pay $22 per square foot; those with less space pay $40 per square foot. The tenant taking up the tiniest amount of space is a paging company that has an antennae on the roof—it pays about $60 per month.

In the Seattle building, carriers and other service providers are executing a variation on the Telehouse theme by buying extra space for their own future growth, and leasing it to their own customers in the meantime. One LEC's co-location customers pay the carrier enough to cover the LEC's monthly rent for its entire share of floor space, Doyne says.

Unlike the Telehouse model, however, Doyne and his colleagues do not manage their customers' equipment. Electricians will wire up a piece of equipment for a tenant, but it is the tenant's responsibility to install equipment and maintain it.

"We make our money in real estate," Doyne jokes. "My staff and I know enough about telecommunications to be dangerous. They need to remember that we are in the real estate business. I don't want them to ever think that I know more about what they are doing than they do, although we have learned a lot from working with them."

Providing an environment that is tailored to the needs of telecommunications service providers is a golden opportunity for the savvy entrepreneur.

"I personally think co-location is a great opportunity for the right person in the right area," says Mark Gershien, senior vice president of national accounts for WorldCom Inc. "I'm surprised there aren't more people doing it."

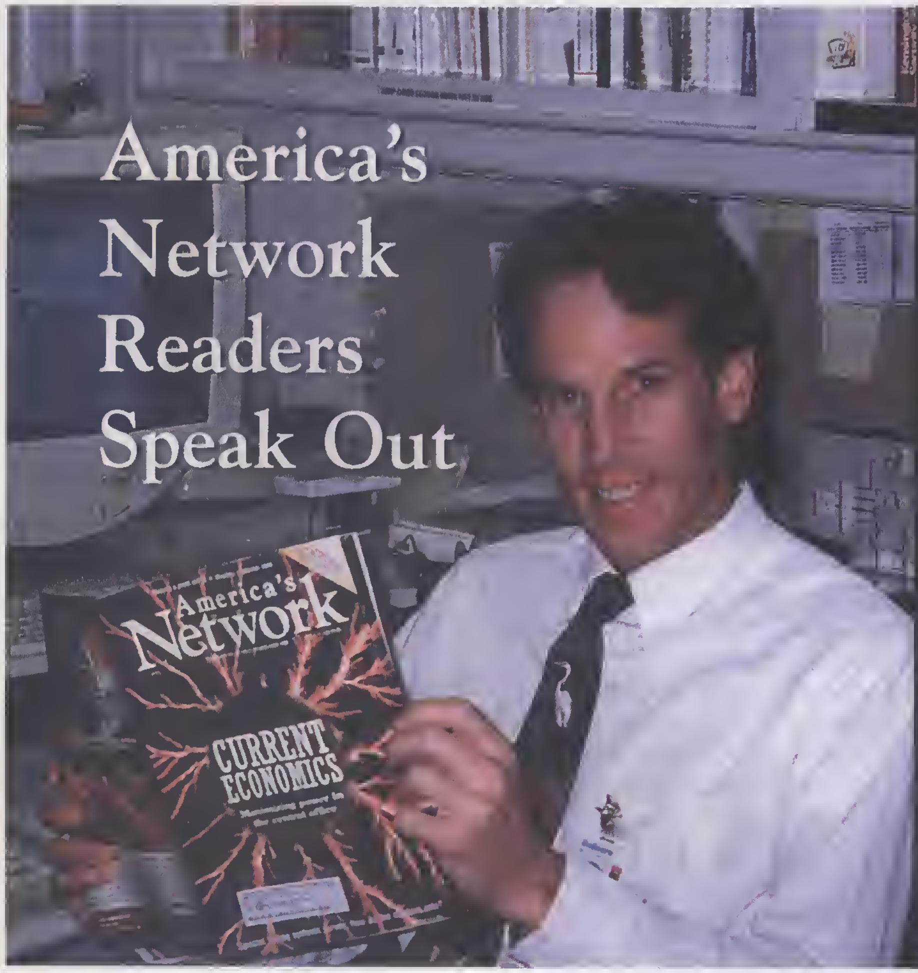
Being the right person is probably what is keeping would-be space providers from flooding the market, according to Mataka.

"It's a tough business for a start-up to become involved in," he says. "You have to be cognizant about facilities, generators, UPSs, battery backup ... all the things that go into creating a CO-class facility. A reputation that leads other carriers to co-locate is also key.

"You need floor-loading capacity and buildings that meet those specs," Teleport's Nocella adds. "It's hard to find that kind of real estate in smaller markets. Nevertheless, the need for space in which companies that do not have economies of scale "in and of themselves," can gain access to more than one service provider will grow for the next three to five years, adds Gabe Cole, president of RTE Group Inc., a Boston-based consultancy which helps commercial property owners structure POP and co-location space.

Historically, companies that have wanted access to telecom facilities have looked for space in the CO, but new players such as voice mail services and debit card companies are looking for other options, Cole says. Unlike other carrier hotels, RTE does not advise its clients to convert regular office space into space for telecom equipment. Instead, the company converts underused space, storage space, mechanical space, basements or penthouses to accommodate its customers needs.

"We do not take commercial space off the market to do this," Cole says. "We represent the building owners' interest and we work from a property perspective." ■



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WIRELINE Notebook

ANNIE LINDSTROM

ADSL UPDATE

Lucent Technologies (Murray Hill, N.J.) rolled out the Broadband-Access Interface Unit (B-AIU), which will allow network service providers to offer high-speed data services such as digital subscriber line (DSL) directly from Lucent's 5ESS-2000 switch. The B-AIU enables carriers to deploy an asymmetrical DSL (ADSL) line from the same shelf as an integrated services digital network (ISDN) line. When used in conjunction with Lucent's AnyMedia Access System, the same ADSL architecture is supported at the central office, remote terminal or digital loop carrier. The complete product line reduces complexity, as well as training and installation costs.

Westell Technologies Inc. (Aurora, Ill.) made room in its heart for discrete and Amati Communications Corp. (Mountain View, Calif.) agreed to a merger worth $394 million early last month. Amati, whose DSL solutions are based on the discrete multitone (DMT) modulation standard rather than the carrierless amplitude phase (CAP) modulation standard favored by Westell, becomes a wholly owned subsidiary of Westell and will continue to operate under the name Amati.

"Westell has seen the writing on the wall that this is not a CAP-only world," says Kieran Taylor, analyst for Verona, N.J.-based TeleChoice. "Many customers are demanding DMT and the quickest way to get it to them is to merge with Amati."

Immediate results of the merger will include DMT standard-compliant solutions on Westell's asynchronous transfer mode-based SuperVision broadband access platform; xDSL technology migration path to very high speed DSL (VDSL) in Westell's system architecture; and an end-to-end systems solution managed by the AccessVision network management platform.

BellSouth announced a trial of its FastAccess ADSL service involving business and residential customers in Birmingham, Ala. The trial will run through the end of May. BellSouth is providing installation and ADSL modems, network interfaces and voice/data splitters to the trial customers at no charge during the eight-month trial. The monthly fee for the residential service is $20. Business customers will pay higher prices for additional capabilities.

Initial participants will use BellSouth.net service to access the Internet during the trial. Unlimited Internet access costs the trial users an additional $30 per month, which is $10 more than its standard dial access service.

IXC HYPE TO HEAT UP

The nation's interexchange carriers (IXCs) will be turning up the hype to grab market share before the regional Bell operating companies (RBOCs) enter the long distance business, according to a new market analysis report from **Insight Research** (Livingston, N.J.). To avert a price war, RBOCs plan to offer customers bundled service on one bill; but that might not be enough to move customers who are used to bundled service offerings they've been getting from the IXCs for some time now, says Robert Rosenberg, president of Insight Research. However, the RBOCs will benefit from knowing their way around the complex local service market and from their regional identities as well as their relationships with small- and medium-sized customers, who are a "rapidly growing segment of the market," he adds.

Insight research forecasts that overall RBOC market share will grow to 25% of the domestic market by 2002, totaling more than $19 billion in revenue.

NO WONDER ISDN AND xDSL ARE HOT

More than 7.6 million Americans will be able to call themselves telecommuters by the end of this year, according to an **IDC/Link** survey released last month at the Telecommuting & Home Office Exposition conference in San Francisco. That's an increase of 7.1% over last year.

What makes this so important to local carriers is that more than half of those telecommuters work for small firms with fewer than 100 employees. The study estimates that 9.1 million households have adults who spend at least three days a month telecommuting.

Smaller firms are leading the way:

65% of telecommuters work for firms with less than 100 employees

22% work for firms with more than 1,000 employees

13% work for firms with 100 to 999 employees

Top five industries for telecommuting:

Healthcare	13.5%
Education	9.0%
Architecture/Engineering/Construction	8.8%
Communications	8.3%
Manufacturing	7.4%
Mean household income for telecommuters:	$58,800

Source: IDC/Link

SBC WINS ADMIRATION OF BUSINESS

SBC Communications Inc. topped the list of *Fortune* Magazine's "most admired" telecommunications companies in the world. The magazine's first global reputation ranking of businesses in different industries was published in *Fortune's* Oct. 27 issue. SBC has ranked first in the magazine's survey of American telecommunications companies for the past two years.

Others telecommunications carriers on the 1997 global list in descending order were NTT, BellSouth, British Telecom, MCI, AT&T, Ericsson, Deutsche Telekom, GTE, France Telecom and Istituto per la Ricostruzione Industriale SpA. An outside consulting firm surveyed senior executives, outside directors and financial analysts to rate the companies on nine criteria: innovativeness; overall quality of management; value as a long term investment; responsibility to the community and the environment; ability to attract and keep talented people; quality of products or services; financial soundness; wise use of corporate assets; and effectiveness in doing business globally.

SHIRA LEVINE

A to-do over what to do with the data

What are carriers keeping in their data warehouse —and what are they doing with everything else?

The idea behind a data warehouse is much like the idea behind that old mainstay of childhood, Tinker Toys—you can just keep adding pieces indefinitely, building a structure as big as your room, as big as your house, as big as the largest thing your 8-year-old mind could envision.

But just as one's Tinker Toys construction is limited by parental spending and available space, data warehouses are constrained by certain unavoidable limits.

"Theoretically, data warehouses are infinitely scaleable," says Doug Hackney, principal at the Enterprise Group (Minneapolis). "There is, however, a practical limit, in terms of what you can support as to budget and resources."

As a result, while telecommunications carriers may have whole-heartedly accepted the concept of data warehousing, they're learning that their grand visions of an enterprise-wide data warehouse populated with every single possible nugget of customer, financial and network information just isn't possible, no matter how large a warehouse they invest in.

For one thing, a nugget isn't just a nugget. To make a 100 gigabyte block of data accessible in a warehouse, a carrier must supplement it with around 100 to 200 gigabits of indexing information and 100 to 200 gigabits of space for summary tables, says David Harris, product director for data warehousing at Sybase (Burlington, Mass.).

"It's typical for that kind of information to take up four or five gigabytes of total data warehouse size," Harris says. "It means that you're going to start using up tremendous amounts of space as time goes on."

SHOULD IT STAY OR SHOULD IT GO?

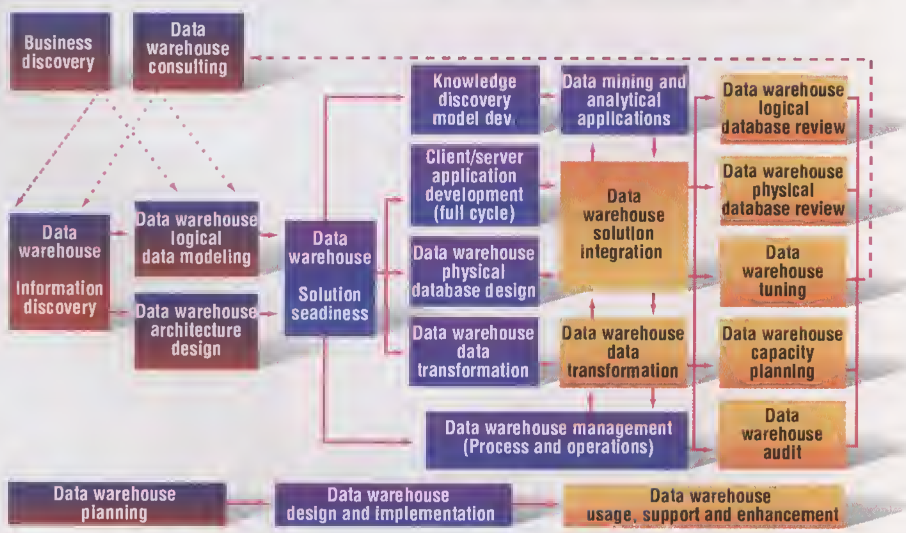
For many carriers, that means that choosing what will be stored on the data warehouse, and for how long, is an important decision to make. Most commonly, telcos are using their data warehouses for information such as customer profiles and segmentation, says Jennie Grimes, manager of the data centers communications group at Hewlett-Packard (Cupertino, Calif.).

"Almost 100% of telcos with some sort of data warehouse are doing that," Grimes says. "They're doing vertical mining, drilling down to the customer's call detail record and also doing horizontal mining, where they're keeping more historical data or detailed summaries, and using that to determine the customer's profile for change."

BellSouth, for example, has created a data warehouse across four customer operations units that stores billing information and other customer data, and is in the process of expanding it to add financial information. Southern New England Telecommunications (SNET) upgraded its data warehouse just a few months ago to accommodate customer history, product information, market information, demographic data and revenue information.

"The smart carriers are using every bit of information that they can legally, and with good purview, obtain," says

Building and managing a data warehouse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Data warehouse Information discovery
Data warehouse logical data modeling
Data warehouse architecture design
Data warehouse Solution seadiness
Knowledge discovery model dev
Client/server application development (full cycle)
Data warehouse physical database design
Data warehouse data transformation
Data mining and analytical applications
Data warehouse solution integration
Data warehouse data transformation
Data warehouse management (Process and operations)
Data warehouse logical database review
Data warehouse physical database review
Data warehouse tuning
Data warehouse capacity planning
Data warehouse audit
Data warehouse planning
Data warehouse design and implementation
Data warehouse usage, support and enhancement

Source: NCR

Paul O'Brien, vice president of the communications industry business unit at NCR (Dayton, Ohio)."The days of sticking stuff in drawers are over."

However, in addition to the space that data takes up in the warehouse, there are other factors that may affect a carrier's ability to load its warehouse with every single nugget of data. Storing large amounts of information can slow the response time to queries, which often prompts companies to limit access to the warehouse.

"With large data warehouses, typically only a small number of people have access to them," says Richard Aroin, director of the telecommunications industry division at Sybase. "In a fast-moving industry like telephony, people who are responsible for a specific operation or for setting up a new line of business need to have very specialized information or to be able to do very fast analysis, and with a large data warehouse, that may not be possible."

Both BellSouth and SNET deal with that problem by taking off data after a certain amount of time has elapsed. BellSouth generally keeps its data live on the data warehouse for three months, then will take it off and store it on tape or microfiche for an unspecified amount of time, says a company spokesman. SNET, on the other hand, generally keeps its data in the warehouse for at least a year, then takes it off for storage on paper in a data center.

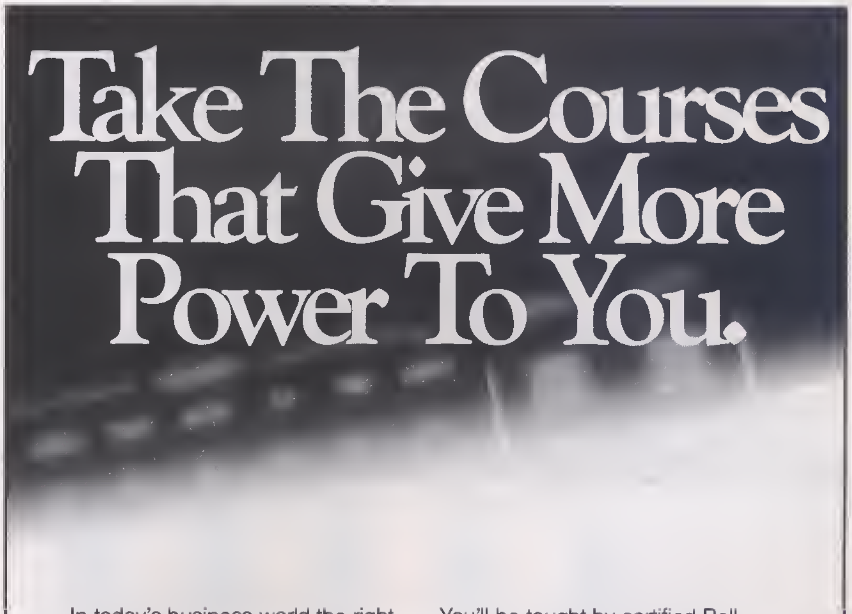
"Marketing people like to see a lot of customer history, so we need to make the decision of how much history we're going to keep live," says Linda Silva, director of marketing information systems at SNET. "It's a cost-benefit type of analysis, where we weigh how much it costs us to keep it in the data warehouse with how much benefit the marketing folks get from it."

SHOPPING AROUND THE DATA MART

Storing data on paper after taking it off a multimillion-dollar, high-tech data warehouse is a seemingly unlikely paradox; most carriers are archiving the information moved from their data warehouses in more sophisticated formats, Sybase's Harris says. While tape and microfiche are options, a better alternative may be optical storage, which can be linked to the data warehouse in a way that is completely transparent to the application, he says.

"With optical storage, the application doesn't see the data as archived information, but as part of the data warehouse," Harris says. "When that particular information is called for, the information view subsystems go out and get the data from optical storage. The access is a little slower, but you can essentially store as many units of information as you want at a very low cost."

Another alternative is to replace some of the functions of the data warehouse with data marts, which are small,



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single-subject warehouses, or, for carriers still in the planning stages, building data marts instead of data warehouses in the first place.

For one thing, because data marts are typically smaller than enterprise-wide data warehouses, they boast faster response times and can provide access to more users.

"Data marts are smaller, skinnied-down versions of the warehouse," says Kevin Johns, segment executive for decision support at IBM's telecommunications and media industries division White Plains, N.Y.). "The game plan with them is to really work more with each business segment, the end users, to determine what particular applications are going to go onto the data mart, so those applications can get to the end users quickly and directly."

Enterprise data warehouses are well-suited for established companies that know in advance what they're looking for, but can seriously limit companies who need specialized information or don't really know exactly what information they're looking for, Sybase's Aroin says. BellSouth's data warehouse, for example, doesn't allow users to look at customer information on a month-by-month basis, but stores changes on an ongoing basis, then provides "snapshots" on an annual or bi-annual basis.

"A large data warehouse may be extremely fast for a set of 10 queries that are asked on a regular basis, but if you're the general manager of a brand-new division and you have a question that is important to your business but has nothing to do with any of the pre-planned queries, you will likely have a very slow response," Aroin says.

Because data marts are typically smaller than enterprise-wide data warehouses, they boast faster response times and can provide access to more users.

But data marts have their dangers, warns the Enterprise Group's Hackney, adding that there's an important difference between architected and non-architected data marts.

"A non-architected data mart is like a little stovepipe data island," he says. "They're little legacy systems that aren't integrated with anything and are horrendous to integrate post-partem. An architected data mart, on the other hand, is built with the intention of integrating it with other data marts or with an enterprise data warehouse."

Another risk with data marts is the danger that they end up "outgrowing their britches," Hewlett-Packard's Grimes says.

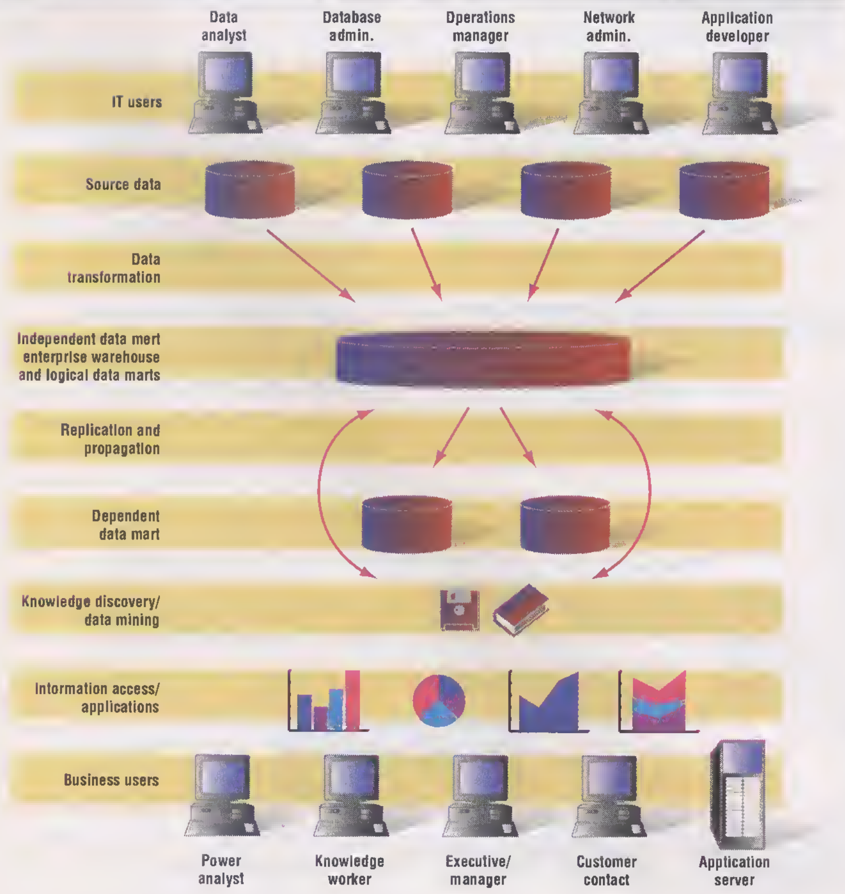
"Data marts start with the premise that the subject matter is very limited and there will be limited refreshes," Grimes says. "Then you see users without prior knowledge of the subject matter using the data mart, and the refreshes become daily, and then the data mart has grown back into a warehouse environment."

Hackney advocates using data marts as part of an incremental move toward an enterprise data warehouse. "Building an enterprise data warehouse from scratch is like saying, 'I want to learn how to paint,' and going out and buying enamels and going to Italy to paint the Sistine Chapel," he says.

Hackney maintains that an enterprise data warehouse is the best possible solution, and architected data marts should be viewed as temporary stepping stones toward that goal. Sybase's Aroin, on the other hand, believes that data marts and data warehouses can coexist happily and peacefully.

"The best solution is a combination of data marts and a data warehouse, where you build a large, corporate-wide data warehouse, then implement a data mart strategy for business divisions," he says. "The divisions can cull information out of the corporate data warehouse and store it in their data marts, so they can run marketing analyses out of the data mart with more effectiveness than if they have to wait for the corporate warehouse to satisfy their requirements." ■

Data warehouse framework



Source: NCR

SHIRA LEVINE

Weeding out the deadbeats

Carrier database red-flags customers who don't pay their bills.

Churn has long been a problem in the telecommunications industry, particularly in long distance, where customers often switch from carrier to carrier, lured by $25 checks and frequent flyer miles. But while churn can lose carriers millions of dollars in potential customer revenue, there's a darker side to the phenomenon that can cost the industry substantially more money: deadbeat customers who run up big bills, then switch carriers.

"Uncollectable accounts are a very large problem, and it's just the beginning," says Liz Titan, principal at American Management Systems Inc. (Fairfax, Va.) "As more and more competition comes to the industry, it's going to get worse."

Until now, data on whether a potential customer has skipped out on a bill has been hard to come by, because antitrust regulations prohibited carriers from sharing that information. On the commercial side, however, carriers have been able to check out a potential customer's background since 1995, when several interexchange carriers, including AT&T, MCI, Sprint, Frontier and Cable & Wireless, won U.S. Department of Justice (DoJ) approval to establish a customer database. The National Telecommunications Data Exchange (NTDE) stores more than 850,000 names of business customers with unpaid accounts. The names have been contributed by 62 carriers.

Buoyed by their success in using the NTDE to reduce their rate of uncollectables, several of those carriers and a few new ones recently got the nod from the DoJ to create a consumer version of the database. The National Consumer Telecommunications Data Exchange (NCTDE) will begin soliciting members within the next 30 to 60 days, and will be operational nationwide by the end of January, says Ken Akins, executive director of the NTDE.

Like the NTDE, the NCTDE will be a blind database, allowing carriers to see if potential customers have one or more delinquent accounts, but not which carrier those accounts are with. "The feeling is that we don't want to make this into a collection tool," says a BellSouth spokesperson. Participating companies will likely pay a joining fee, as well as a per-transaction charge, which was not yet set at press time.

The problem of unpaid accounts has only grown worse over the last few years as competition incited a customer-acquisition frenzy. "The Telecom Bill of 1996 has put an enormous strain on record-keeping and management," says Val Perry, senior vice president and general manager of the telecommunications and utilities solutions unit at Equifax (Atlanta), which already manages the NTDE and will create and manage the NCTDE. "Companies are more driven to marketing, putting new accounts on the books, but those aren't always good accounts. We're helping them with that by identifying former deadbeat customers."

FOUNDING MEMBERS OF THE NCTDE
AT&T
BellSouth
Citizens Utilities
Frontier
IXC
Nynex Long Distance
Sprint
WorldCom

Carriers also blame broader social problems for recent increases in deadbeats. "It's part of a trend," says Michael Bray, assistant vice president of Sprint's consumer services group operations. "Consumers' bad debt has increased overall over the past 18 months or so, with consumer bankruptcies and credit card debt at an all-time high."

Whatever the reason behind the rise in deadbeats, carriers involved with the NCTDE agree: the database will be a valuable tool. While most incumbent local exchange carriers cannot refuse service to residential customers, they can require a deposit or provide restricted service if they know that a customer has skipped out on a prior bill.

In many states, a carrier cannot refuse service based on a customer's poor credit report—historically, the industry's only way to identify potential problem customers—but can refuse service if it has proof that the customer has skipped out on another carrier's bill, a Frontier spokesperson says.

But not all carriers are as thrilled with the idea of the database. Although the former Nynex's long-distance subsidiary is one of the original participants of the NCTDE, its new parent company, Bell Atlantic, says it may not participate in the January venture. "We're not changing our standards for our review of a customer's credit history," says a Bell Atlantic spokesperson, adding that the carrier believes its use of credit reporting agencies meets its needs. ■

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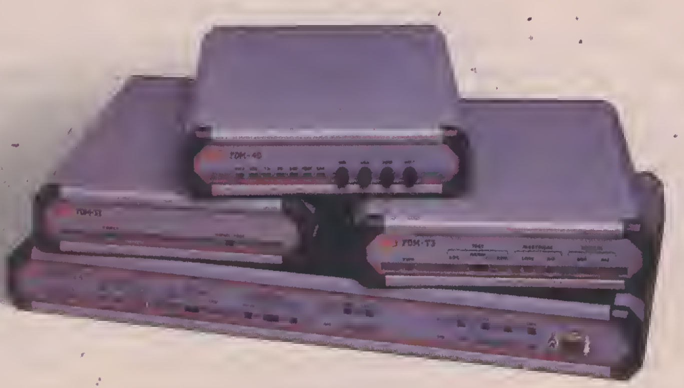

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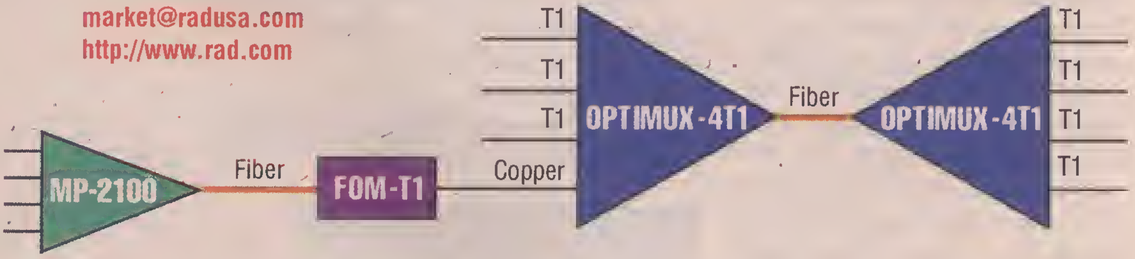

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DAVID KOPF

Does one size fit all?

RAID storage provides carriers with the data availability they need, but what deployment issues do they face?

There's a good chance that telco data centers may begin to look like your neighbor's garage: stuffed so full, that the important stuff, like their cars, is now sitting on the street.

As users begin demanding more multimedia-oriented servers, telcos will have to seriously examine how they deploy and maintain their storage systems, and a crucial element to those strategies are Redundant Arrays of Independent Disks (RAID).

"Storage requirements for telcos, whether they be for applications like interactive voice response (IVR), voice messaging, paging, any type of Internet application, over the next several years are really going to increase in use," says Mike McNamara, product manager for Clariion (Southboro, Mass.), a business unit of Data General Corp. that manufactures RAID-based storage solutions. "Consequently, their storage requirements are going to increase—particularly for applications that are going to merge video and mail and voice mail and e-mail together."

Already, telcos are deploying RAID storage systems to meet current and future applications, but arriving at a scalable, flexible storage strategy is crucial. Otherwise, tragedy, in the form of lost customer data, may ensue.

"What we're learning from telecom vendors is that it's a 24-by-seven world," says Anne Murphy, vice president of marketing for Storage Computer Corp. (nashua NH.). "There just isn't downtime. So they need very reliable storage solutions."

For telcos, RAID 5 is probably the most applicable level, especially for interactive voice response (IVR), voice messaging and paging applications.

RAID: WHAT'S IN A LEVEL?

The most confusing element of RAID technology is its level classifications. These levels are based on a late 1980s paper produced at the University of California at Berkeley that identified various extended data availability and protection (EDAP) for disk storage known as RAID levels 1 through 6.

Judging from the numbers, one might conclude that higher means better, but nothing could be further from the truth. All the numbers describe are the data storage and archiving processes that each level offers. These processes are based on two fundamental concepts, according to the RAID Advisory Board (RAB): mirroring and parity.

Mirroring uses redundant drives to duplicate data with 100% redundancy. Its benefit is that it maintains a high level of data availability and quick access, but its drawback is that cloning drives is an expensive process.

With parity, a specific amount of storage space (usually between 10% and 33%, according to the RAB) is allocated to parity data, which can be used to reconstruct the stored, core data residing on the remaining space. Parity's main sell is its cost-to-performance ratio. The technology offers high levels of data availability and recoverability at decent speeds, and at a cheaper price than complete mirroring.

Three common RAID levels are 1, 3 and 5, according to McNamara. RAID 1 is a mirrored pair. "What's on one disk is exactly duplicated on the other," he says. "The pros are that it's extremely safe and that performance is good. The negative is that it's expensive. A whole drive is expended to copy data."

RAID 3 includes a dedicated parity drive. For instance, in a grouping of five drives—known as a logical unit—data is striped across four drives with parity residing on the fifth drive. "The benefit is that it's very good for storing large file sizes where you're doing a lot of sequential reads," McNamara says.

RAID 5 essentially stripes data and parity across all drive units at the same time. RAID 5's benefit is that if a drive fails, its data is not lost. "RAID 5 is good for small block transactions, small block I/Os [input/outputs], online transactions, database apps, decision support, data warehousing," he says. "It's a good combination of performance and high availability."

For telcos, McNamara says the most applicable RAID level is most likely RAID 5, especially for IVR, voice messaging and paging applications. "Typically in the voice messaging arena, [telcos aren't] transferring huge blocks of data, they're transferring small blocks of data, and they want to do it quickly, so RAID 5 is really good for the short transactions that are happening today," he says. "It's also a pretty good combination of cost and performance."

Cost-to-performance appeal is a key issue in deploying storage systems, according to Murphy, because without it, carriers can't quickly differentiate themselves from their competition.

However, carriers also need to come up with a wise strategy for deploying those fast, cheap, reliable storage resources.

Some specific arms of telcos, such as an Internet service provider (ISP) division might also want to consider RAID 3 systems, especially if they're offering video services, or other applications requiring storing large blocks of data that will be transferred in a sequential fashion, one after the other.

"If there's going to be a lot of transfer of big blocks of data—they're going to be transferring large video files, such as video post production—ISPs are going to be using RAID 3," he says.

CENTRALIZED CONTROL

Centralized control of remote arrays should serve as the foundations for those strategies, according to McNamara and Murphy. Many applications may see multiple gigabytes of terabytes of distributed data that must be managed from a central site.

Despite the best laid storage plans, there are going to be catastrophes: drives fail, and input/output points drop out. These are facts of life.

"The benefits of centralized management of storage is that [carriers] can maintain very very high reliability, and high performance characteristics," Murphy says. "At the same time you're keeping costs very much under control, which is a big concern for telecommunications vendors today. The market is so competitive, and the services they offer have to be at the best price to attract customers."

"It's not just the hardware, you've got to look at the hardware and the software —you have to look at the total package," Clariion's McNamara adds. "You need software tools to manage that array from a remote location and manage in a lights out environment."

Those software tools should provide telco personnel with the functionalities they are familiar with in managing and maintaining networks: a total view of the storage system, with independent element management and event notification that alerts managers to drive failures and other problems.

Also, those systems should provide on-the-fly configuration of arrays. "You should be able to go in and configure the RAID levels," he says. "You should be able to say 'I want to make these drives RAID 5 and these drive RAID 3.'"

ELIMINATING DOWNTIME, INCREASING PERFORMANCE

Despite the best laid storage plans, there are going to be catastrophes: drives fail, and input/output points drop out. These are facts of life. However, that's why RAID incorporates storage protection methods such as parity. But what happens when multiple drives fail and parity may be lost?

"With multiple concurrent drive failures you, one, absolutely have downtime," Murphy says. "Two, you've got data recovery problems, which means you better have backed up the data to an archival device like a tape. With arrays that have such enormous numbers of disks, up to 48 drives in a single array, the disk drive is probably the most failure-prone component. So, that really becomes an issue."

To combat multiple drives failing at once, Murphy says parity protection, which writes critical data a second time across a RAID array in such a way that it can still be recovered, should be a consideration in deploying RAID storage systems.

Besides parity protection, Murphy says telcos might want to avoid attaching multiple disk drives to a single controller channel. If that channel fails, all the attached drives will be lost. "And," Murphy adds, "Multiple, concurrent channel failures are very unlikely."

Adding channels should not only protect against failure, but should boost performance as well. When telcos scale up in terms of storage capacity, they start losing performance, Murphy says. To beat performance dips, carriers should look for parallel, asynchronous architectures, that increase capacity, in the form of more dedicated, intelligent channels—the links between servers and drives—as carriers add capacity.

"What you really want is distributed intelligence among the array," Murphy says. "Multiple memory operations can be occurring concurrently because you've got intelligence spread throughout the unit."

SCALABILITY

A key element in scaling today's RAID storage for tomorrow's applications is supporting open platforms, according to both Murphy and McNamara.

"You need support for all open-system host platforms so that you can connect multiple hosts from one platform to another," Murphy says. "You need that scalability on all levels. You need it in terms of performance, you need it in terms of host connectivity, you need it in terms of capacity and you need it in terms of data protection.

"That's what keeps your costs under control and that's what keeps [carriers] competitive in their market." ■

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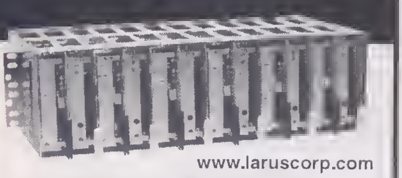

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SERVICES Notebook

SHIRA LEVINE

ANSWERSOFT UPGRADES, CUSTOMER BASE EXPANDS

AnswerSoft released the latest generation of its flagship call-center automation software, Sixth Sense 4.0. Sixth Sense lets organizations seamlessly link applications, databases and communications technologies to deliver customer data to a service representative's desktop simultaneously with the customer's call. In addition, AnswerSoft's SmartRoute 2.0 product routes calls to the best possible agent based on call data and information from customer records. The SoftPhone Agent software monitors call-center activity using a specialized graphical user interface.

Metrocall, the country's fifth-largest paging and wireless messaging services provider, said it plans to expand its use of AnswerSoft software to call centers throughout its service area. Metrocall first installed AnswerSoft's automation software in its Alexandria, Va., call center in late 1996 and plans to integrate the software into an additional five centers by the end of 1998.

In addition, electric utility **Southern Co.** is integrating its telephony and information technology systems with its workgroup processes using AnswerSoft's automation software as part of an upgrade of its enterprise-wide call-center automation system.

FIRSTS IN THE PHILIPPINES

Ericsson will provide **Digital Communications Philippines Inc**. with a suite of integrated call center and intelligent network products, making the network operator the first in the Philippines to operate advanced call centers that use network-wide, intelligent network capabilities. The package of products will include operator services and switching equipment, 200 operator terminals, an Interactive Voice Response (IVR) system with voice recognition, and intelligent network services, including the service management system and service creation system.

Also in the Philippines, **Hughes Network Systems**' frame relay switching network has been chosen by the **Manila Electric Power Co. (Meralco)** to interconnect its regional, district, branch and local offices in metropolitan Manila and surrounding provinces. The frame relay network—Manila's first—will act as a high-reliability backbone to support Meralco's customer management and distribution management systems.

TCSI TEAMS WITH UNIDATA

TCSI Corp. will incorporate Unidata's database management technology into its network management software solution for carriers.

Using the Unidata technology, future generations of TCSI's SolutionCore development environment will provide the capability to deliver object storage solutions that can be mapped to relational databases or Unidata's O2 object database. SolutionCore is expected to incorporate the Unidata technology by early 1998.

AMERITECH LICENSES SERVICE PROVISIONING

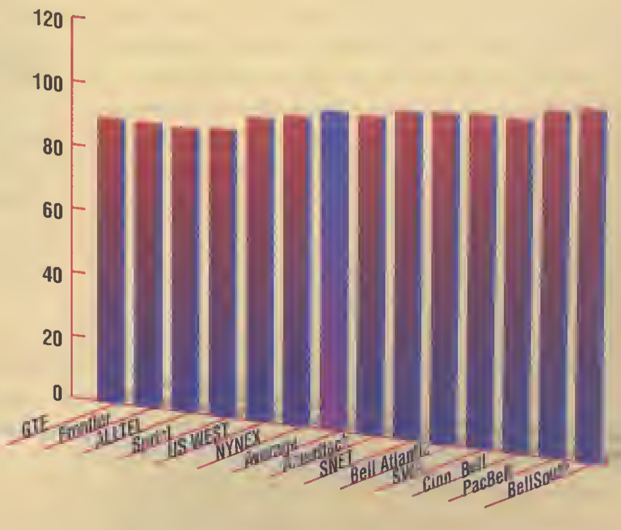
Ameritech will license **Architel Systems Corp.'s** Automatic Service Activation Program (ASAP), a software system that provisions services—ranging from basic telephony to enhanced services—in the local, long distance and wireless markets.

Under terms of the license, Ameritech will be able to use ASAP for automated service activation and network configuration for its GlobalDesk Managed Services offering, a collection of network management services and support for large corporate and institutional customers. Architel will also provide ASAP installation and integration services to Ameritech.

CUSTOMERS ARE HAPPY WITH INCUMBENTS

Residential local telephone customers are more satisfied with service from their incumbent regional Bell operating company than with service from independent competitors, according to the J.D. Power and Associates 1997 customer satisfaction study. The survey, which asked 15,600 consumers to rank their local carrier in areas such as customer service, cost of service, corporate image, call quality and promotions, also found that 43% of customers prefer their local carrier over their long-distance carrier as their sole telecommunications provider, vs. only 35% in 1996.

Carriers were assigned an index score, with 100 being the average, based on consumers' perception of various factors that affect customer satisfaction. Factors were weighed according to respondents' ranking of importance, with customer service, cost of service and corporate image leading the list.



INTERNET

FRANK BERNHARD

Market Engineering

The paradox of growth

Can ISPs capture market share in a prosperous future?

In a few short years, soaring technology and consumer demand have wrought the rapid emergence of literally thousands of new Internet Service Providers (ISPs). Yet, with competition, most ISPs have ignored the principles of *market saturation*, begging the question of their long-term viability in a market driven by commodity service subscriptions.

With the personal computing revolution well under way, the steady growth rate for Internet services appears to be "at par" with the rate at which network and processor devices are advancing. With major providers such as AT&T, MCI, Sprint and several of the largest regional Bell operating companies (RBOCs) operating in the ISP market, the attraction has spawned significant opportunities for the homegrown provider. But what's wrong with this picture?

ISPs AS A NEW MEDIA PLATFORM

Given the finite population of users and heightened ratios between ISPs and consumers, an excess supply condition looms. When markets experience saturation, survivability hinges upon the ability of ISPs to modify positioning strategies to address niche customer segments. ISPs must expand their offerings to innovate additional products that extend users' perceptions of value and reach of productivity.

To stay ahead of the competition, leading ISPs must dodge the roadblocks of strict connectivity services and venture into the realm of media management. Media, by definition, provides a platform or host of communication abilities. With the Web acting as an electronic medium, ISPs have the opportunity to manage an information channel through which their users connect.

Long heralded as the lifeline to sales and corporate identity, advertising has taken a new upswing in this age of Web-enabled customer groups; indeed, the results of purchased Internet promotion are staggering. Since 1995, alone, corporate expenditures for electronic marketing continue to skyrocket, with latest figures showing a 350% climb in total revenues over the previous year. And as more traditional advertisers reference their Web sites in print and other media, the Internet will evolve as a concentration point for managing an organization's message.

Frank Bernhard is a principal economist and market consultant in Northern California; he can be reached at fbernhard@advanstar.com

Now, take the ISP and add the value of content provision. As the first point of contact, ISPs gain a unique stronghold by acting as a service extension—disseminating user-selected information on a per-session basis. Examples include customized news information, stock quotes, desktop messaging, and others. Yet, while it is somewhat difficult to measure the exact economic value of these services, most ISPs would agree that customer retention benefits far outweigh the costs or resources necessary to ensure extension support.

Tomorrow's Internet subscriber will demand a new set of preferences—tools such as messaging technology and database applications—to complement their productivity and usage objectives. And given the phenomenal development efforts to extend database applications to the Web, more subscribers will depend on ISPs to anchor their relationships with varied systems.

Already, choice providers have begun to capitalize on the design and management of corporate intranets—recognizing that an outsourced relationship with the customer enables strategic efficiency in delivering information services. With an improved understanding of the customer's value proposition, ISPs should seize the chance to segment their market audience and engineer service plans that assure satisfaction throughout the spectrum of users.

SCALABLE CUSTOMERS

Flexible services and static customer requirements characterize the interaction of ISPs and tomorrow's customers. Recent trend analysis indicates growing user movement toward providers that emphasize *speed* and *tiered access.*

Speed may best be qualified as a derivative of *performance benefit*—whereby users choose a level of throughput at a price that satisfies the application requisite. A majority of customers fail to witness the value of marginal speed gains, but quickly take notice of service disruptions or access problems.

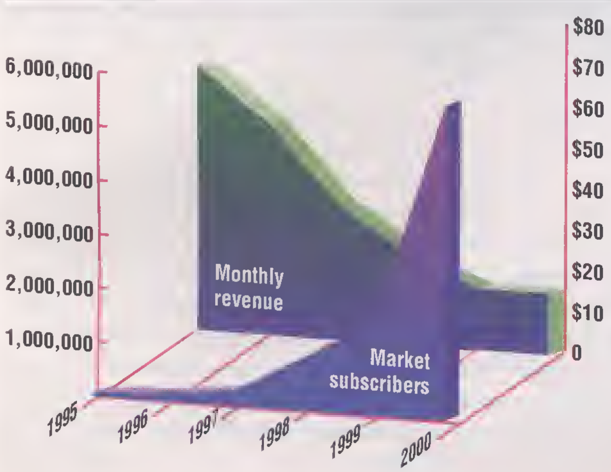
The ISP feature matrix

	AT&T WorldNet	Concentric	EarthLink	IBM Internet	MCI Internet	MindSpring
Software support						
Windows95	Yes	Yes	Yes	Yes	Yes	Yes
Windows 3.x	Yes	Yes	Yes	Yes	Yes	Yes
Mac OS	Yes	Yes	Yes	Yes	No	Yes
OS/2	Yes	No	Yes	No	No	No
Web browser	Explorer 3.x or Netscape Navigator	Explorer 3.x	Netscape Navigator	Netscape Navigator	Explorer 3.x	Explorer 3.x
Connectivity						
E-mail addresses	1	1	1	6	1	1
Toll-free access	$4.50/hr	$5.00/hr	$4.95/hr	$6.00/hr	$5.95/hr	$7.50/hr
Static IP address	No	No	No	No	No	No
Leased line connections	No	Yes	No	Yes	Yes	No
ISDN connections	No	No	Yes	Yes	No	Yes
Direct TCP/IP connections	Yes	Yes	Yes	Yes	Yes	Yes
56 kbps access fees	N/A	$0.25/hr	No	No	N/A	No
K56Flex support	N/A	No	Yes	No	N/A	No
x2 support	N/A	Yes	No	Yes	N/A	Yes
Maximum dial-up speed	28.8 kbps	56 kbps	56 kbps	56 kbps	28.8 kbps	56 kbps
U.S. POPs	225	155	673	530	300	257
Web host services						
Free Web site space	No	5Mb	6Mb	N/A	N/A	5Mb
Extra space	$4.95/5Mb	$2.00/1Mb	Variable	N/A	N/A	N/A
Java support	Yes	Yes	No	N/A	N/A	No
CGI support	No	Yes	No	N/A	N/A	No
Site traffic reports	No	No	Yes	N/A	N/A	Yes

The concept of tiered access refers to the rationale of setting service levels in accordance with customer usage needs—establishing a triage of users that require varied quantities or hours of access. Historically, providers launched connectivity programs at a metered rate (hourly), but soon switched to unlimited access for a flat fee schedule. This caused network congestion and poor accessibility during peak service hours, and resultingly, customer retention hit an all-time low, and ISPs were forced to rethink a tiered approach toward service planning.

While ISP demographics are diverse with respect to commercial and personal use, principal Internet users share the common thread of remote connectivity to business productivity tools—e-mail, financial updates and database applications. With the vigorous trend toward telecommuting and the explosion of corporate intranets, ISPs can further enhance their position by scaling services to act as a virtual office environment. This lets users justify expenses and establish a framework for investment.

Monthly revenue per subscriber vs. market growth (U.S.)



Part and parcel to connectivity, a strategic opportunity exists for savvy ISPs that offer an advanced suite of consulting and professional services.

ABOVE THE CALL FOR NETWORK RELIABILITY

Today's push toward reliability and ease of access introduces a facet of service provision that must not be overlooked. In examining network performance, ISPs need to ensure a stable rise in customer satisfaction levels by consistently meeting the terms of user Service Level Agreements (SLAs), and they must implement internal standards for monitoring threshold attainment.

At the center of establishing baseline capacities and performance guidelines, providers ought to control the technical efficiency of their networks—identifying gaps in hardware devices such as routers and gateways—to avoid a lapse in customer service, and should allocate resources more effectively to reduce operating expenses.

THE ROAD LESS TRAVELED

While the financial horizon beams with untold dollar potential, ISPs must take stock in transforming the business of Internet connectivity into an avenue of media management. From the essential design of a customer interface and throughout the scope of external advertising, content provision is paramount to future differentiation.

Looking back at the evolution of online services, market allure rested in the variety of services that could be accessed from a single point of contact—airline reservations, classified advertising, messaging and much more—saving valuable time for subscribers. These firms have persisted in opening new services that include electronic commerce and multimedia.

Today, the development of contemporary Web tools and the elevated maturity of the Internet has launched a bright future for innovators to harness the new medium's potential. Unlike traditional media such as print and video, the Internet affords the feature of interaction—extending the ISP's role into a new dimension of communication.

But where all roads cross, the common denominator lies in the ability to deliver and manage *information*. Future challengers must unravel the puzzle of knowledge exchange—broadening a portfolio of services that seamlessly glues each piece of communication together.

Otherwise, a majority of providers might just choose a road that leads to a dead end. ■

INTERNET Notebook

DAVID KOPF

NEW MCI, SPRINT OFFERINGS TAKE CRACKS AT HACKERS

MCI (Washington) and **Sprint** (Kansas City, Mo.) have announced technology and service upgrades, respectively, geared to increase Internet security and give hackers and their ilk mind-numbing headaches.

MCI has debuted its networkMCI Denial of Services (DoS) Tracker, which was developed by internetMCI Security to monitor network activity, detect denial of service attacks and automatically trace them back to their sources. Denial of service attacks are aimed at bringing down a provider's network through flooding it with multitudinous requests and/or traffic. Automating a process that, when done manually, usually requires many hours and highly trained engineers, MCI's solution can sniff out a hacker within minutes.

"When a hacker breaks into a network, we all pay the price," says Rob Hagens, Sprint's director of Internet Engineering. "Hackers cost major corporations and ordinary consumers millions of dollars a year in network downtime, and many small ISPs don't have the sophisticated tools necessary to track down these individuals and prosecute them."

So, MCI has made the solution available on its Internet site for free downloading. Any interested parties can obtain the gratis software from the Web at: www.security.mci.net/dostracker.

"By making the DoS tracker available for free," Hagens continues, "MCI is providing the Internet community with an effective new tool that will help in the detection and identification of hackers."

Among the attacks that DoS Tracker can trace are SYN, ICMP Flood, Bandwidth Saturation and Concentrated Source. Modifications are being made to add other methods to the roster, including a new attack called the Smurf.

Sprint's anti-hacker offensive results from the carrier's recent integration of **Security Dynamics Technologies Inc's** (Glenwood, Md.) SecurID and ACE/Server user authentication products into its suite of managed security solutions.

The addition lets Sprint, as a centralized manager of Internet Protocol (IP) security, provide businesses with protection against unauthorized Internet and intranet access to e-mail, files and databases.

A key element in the SecurID solution is Security Dynamics' one-time passcode technology. At login, users enter a personal identification number (PIN), followed by a code displayed on a SecurID token card, which changes every 60 seconds. The ACE/Server network security software then verifies the code.

Along with authentication services, Sprint's managed IP security offerings also includes complete firewall solutions, 24-hour emergency response, customer firewall vulnerability scanning, security alerts,. investigation support, and liaison support with worldwide security and legal authorities.

MEANS, MRNET MERGE TO FORM LARGEST U.S. REGIONAL ISP

MEANS Telecom (Minneapolis.) and **Minnesota Regional Network** (MRNet; Minneapolis) a nonprofit organization as well as Minnesota's oldest ISP have signed a purchase agreement to complete the merger of both providers' Internet service operations, forming America's largest regional ISP.

Both service providers' boards of directors green-lighted the merger, leaving MRNet's membership and the Attorney General to have had their say by press time.

The merger, if approved, will result in a wholly-owned subsidiary of MEANS, which will be newly incorporated into MRNet early this month. All assets (equipment, trademarks, receivables etc.) belonging to **Minnesota Regional Network Corp.** and **MRNet Internet Services** are included in the deal's $2.5 million to $3 million purchase price. All proceeds of the sale will go to another nonprofit, whose mission is consistent with that of MRNet.

Where infrastructure is concerned, the new corporation's initial operating plan will include a third Twin Cities hub site and redundant interconnection of all hubs in the Twin Cities area.

NORTEL UNVEILS 1 MBPS MODEMS

Nortel (Brampton, Ontario) has upped the modem ante with 1-Meg Modem, a mass-market modem technology geared to offer "always up" connections that are up to 17 times faster (downstream) than 56 kbps modems.

The modems, which connect to users' PCs via Ethernet, will deliver 1 Mbps throughput downstream from the central office (CO) and 120 kbps upstream. The technology is compatible with carriers' Frame Relay and asynchronous transfer mode (ATM) backbones, enabling connections between users and Internet service providers (ISPs) that are constantly up.

Users can install the modems in standard, plug-and-play fashion, and deployment at the CO end requires, according to Nortel, minimal rewiring. Any Nortel peripheral based on the vendor's Line Concentrating Module (LCM) can be upgraded to deliver 1-Meg data service, along with voice, over the same phone line.

In addition to Nortel's DMS SuperNode, DMS-10 and Meridian SL-100 switches, the technology will be available on the vendor's AccessNode Express digital loop carrier and will be integrated into its Internet Thruway Internet traffic rerouting solution.

The 1-Meg Modem rollout timeline will span 1998, with support for the DMS SuperNode CO switch and Meridian SL-100 private branch exchange available in first quarter 1998; line card upgrades for DMS SuperNode remote-access devices and DMS-10 telephone switch by second quarter 1998; and integration of 1-Meg Modem into the AccessNode platform by the second half 1998.

Nortel says that a cheap, easily installed megabit connection might whet customers' appetites for carriers' upcoming asymmetrical digital subscriber line service (ADSL) offerings. Needless to say, 1-Meg's appeal is similar to ADSL's. For the past year, Nortel has worked with customers, in what has been called the X-Net program, trying to develop an Internet access technology that would drive down equipment costs and deployment issues.

PHONE CRIME FEARS

RECALL

FROM THE AMERICA'S NETWORK ARCHIVES

"The quick communication provided by the telephone has been repeatedly made use of by men engaged in criminal lines of business." So states the November 1909 issue of *America's Network* grandfather *Telephone Engineer* in "Unlawful Use of the Telephone."

From con artists and grafters to bookmakers and burglars, the article describes the many low-down uses for phones emerging in the early days of America's telecommunications industry. Moreover, the article addresses service providers' fears that they will be held responsible for such activity.

"If the telephone company knowingly installs an instrument and permits it to be used for criminal purposes, it might possibly become a party to the crime, and criminally liable either in its corporate capacity or through its officers," The article reads.

However, a more creative missive in the same issue, "The Dark Side of the Telephone," illustrates such criminal phone use with a fictional account of a pair of burglars checking via phone to see if victims are home or not. The story is best described as goofy:

The drama unfolds thusly: "Jimmie took the receiver from the hook and asked 'Cedar 4-2-6-5.' 'Dat's de ole banker Blake, got rocks to burn—an' diamonds, gee whiz you oughter to see his wife's diamonds,' he explained to Bill. Jimmie waited a moment and the answer came promptly, a man's voice: 'This is Cedar 4-2-6-5. Who is it please?' Jimmie did not open his mouth. He simply hung up the receiver with a snap. 'Dey's at home,' he whispered."

Eventually the two hoods find an unoccupied home and rob it: "When they climbed the back fence with their swag, Jimmie remarked: 'Well, dis'll run us a couple o' years, and dat puts me even on de telephone game.'" —*D. Kopf*

CDPD COMES TO P.D.'S RESCUE

A wireless modem about the size of a credit card will help Jacksonville police officers spend more time in the community and less time shuffling papers in the office. The officers will use a wireless Cellular Digital Packet Data (CDPD) modem to electronically transmit incident and arrest reports (watch out Zsa Zsa Gabor).

With electronic reporting, the officers will no longer have to hand-deliver reports to the station and can increase the time they spend in the community solving problems (and hopefully giving out less parking tickets).

"The old system is just time-consuming," says Sgt. Art Parker of the Jacksonville Sheriff's Office. "Officers have to deliver handwritten criminal reports to the station three to four times a day. With the new modem, officers can transmit reports wireless without leaving their cars." In fact, Parker says the reports can be delivered almost simultaneously.

The time saved on arrest reports is expected to be an average of 20 minutes per report and up to 55 minutes per arrest. The time officers save on administrative tasks will be used to develop and facilitate an effective crime prevention strategy.
—*D. Sklar*

Sensitivity training

The more adventurous "net heads" surfing the Pacific Bell Internet Directory (PBD) website for body piercing specialists, adult-entertainers or other "service-oriented" listings, will have to get their information elsewhere. Apparently, Pac Bell has identified these and other headings as "sensitive" and will not be including them in its PBD Internet Guide.

Citing the unrestricted nature of the Internet and the potential for provocative content which might offend some people, Pac Bell designated as sensitive the following headings: Entertainers—Family and Business, Escort Service—Personal, Massage, Massage Therapeutic and Singing and Entertaining Telegrams.

Also, advertisers under those headings in Pac Bell's A-Z Yellow Pages will be prohibited from publishing their Web site or e-mail addresses in their ads.

Speaking of headings, the following new ones became operative since the beginning of this year—further evidence of our increasingly service-oriented economy: Personal Trainers, Transportation Providers, Construction—Clean Up Services, Pain Management, Day Spas and Medical Information Research.

Next thing you know, you'll be able to look up: Contacting Elvis, Marilyn Monroe and James Dean...or do they have those already? —*D.S.*

THE WHOLE WORLD WILL BE HUMMING 'FEELINGS'

Wegener Corp. (Duluth, Ga.) announces it's received an order for more than $1 million in digital audio satellite receivers from none-other than the elevator-music dynasty Muzak Inc. According to sources at Wegener, the receivers will give Muzak digital audio quality and "powerful network control" capabilities. —*D.S.*

Simple POP solution

The Tigris Integrated Access Platform is a stackable, three-slot remote access system providing ISPs with a single solution for delivering information to a large number of remote sites and users. An entry level POP variation doesn't require an additional router to connect the remote POP to a central backbone.

The Tigris T1/E1 POP bundle, based on a three-slot chassis, includes a control card with four ISDN PRIs and two 10 Mbps or 100 Mbps Ethernet ports, and a 48- or 62-port modem card. The additional T1/E1 lines can support routing back to a central site, eliminating the need for additional hardware investment. The solution also leaves one slot open for an additional 48 - or 62-port modem, universal WAN, or T1/E1 ISDN PRI card. *Advanced Computer Communications (Santa Barbara, Calif.)*

Visit www.acc.com or Circle 217

Aerial cable lashing

The Apollo Aerial Cable Lashing Machine provides reliable parallel pull at a low weight. The unit securely lashes single or multiple installations of all types of telecom cables, including copper, fiber and coaxial. It can also lash combinations of cable and innerduct. All smooth edges provide 360-degree protection against cable damage.

The device pulls parallel to the strand as a result of being driven by the lashing wire through a positive gear drive (no belts, no friction drive) which has been reliable in tests exceeding 1 million cycles. The gear-driven traction allows the machine to be pulled from any forward angle, letting crews deploy the lasher through crowded and overgrown cable routes.

Each lasher also includes a 6' polypropylene towing bridle and a rugged, weather-tight storage chest.
GMP (Trevose, Pa.)

Call 215/357-5500 or Circle 206

Messaging Server

Post.Office 3.1 helps solve a common problem encountered by ISPs: the unauthorized use of e-mail services to send unsolicited bulk messages, or "spam" mail. The server offers advanced performance and reliability, simplified management features and proven scalability.

Using a variety of IP address and domain name restrictions, the system lets ISPs deny use of their messaging servers as relay hosts for unsolicited e-mail and block unwanted e-mail from entering their service, thereby eliminating unwanted network congestion. A single server can scale to support 150,000 subscribers. A natural upgrade to sendmail-based systems, it offers security and simple administration through remote Web-based forms.
Software.com Inc. (Santa Barbara, Calif.)

Visit www.software.com or Circle 205

Service provider storage

The SM 4.2 supports 12 GB optical drivers with dual heads and libraries with storage capacity up to 1.73 TB and scalable to 13.6 TB depending on the FileTek Storage Machine Enterprise Data Architecture (SM/EDA) system configuration.

Organizations can capitalize on substantially increased speed with which archived data can be retrieved from the dual-head, 12" Write-Once, Read-many (WORM) optical disk, integrated with the product's advanced hierarchical store management of massive amounts of data.

The archive server supports data management of mainframe and network environments concurrently.
FileTek Inc. (Rockville, Md.)

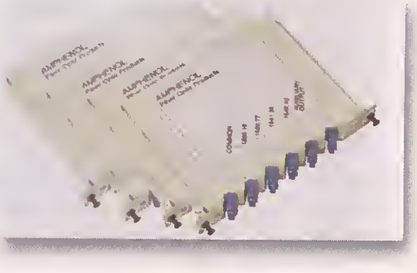
Visit www.filetek.com or Circle 212

Multichannel DWDMs

Multichannel Dense Wave Division Multiplexers (DWDMs) feature a flexible design allowing modular expansion from 4 to 16 channels. Standard DWDM network configurations of 4, 8 or 16 channels also are available.

The International Telecommunication Union (ITU) grid is followed for channel spacings in the standard product offerings. High isolation and low insertion loss are achieved in unidirectional or bidirectional operating modes. The DWDMs also offer thermal and polarization stability. The products are offered in flat-pack modules or 948 Series fiber management system cartridges. Termination options include fiber optic connector, (FC), SC call render and straight-tip connector (ST), with standard polish choices. *Amphenol Fiber Optics Products (Lisle, Ill.)*

Call 800/944-6446 or Circle 219



Quick wireless testing

To help wireless telecommunication field technicians get fast, repeatable and reliable test results, a single-box test instrument has been introduced. The HP 8935 lets technicians test personal communications services (PCS) and cellular base stations in outdoor environments, and combines analyzer, source and computing capabilities in a single box. The HP 8935 uses code division multiple access (CDMA) technology to test base stations.

About the size of a "carry-on" suitcase, the test box is easily transported from one site to another. It includes a water-resistant, membrane keypad and a gasket display monitor sealed to help protect the test set from moisture and dirt. Additionally, the test set comes standard with a 6.5 ", bright electro-luminescent display to help make it easy for technicians to read the screen —even in sunlight or at night. The test set will be available next month for $39,700.

Hewlett Packard Co. (Palo Alto, Calif.)

Visit www.hp.com/go/tmdir. or Circle 210

Call generators

Call generators simulate traffic load conditions, and are used to simulate the complex calling scenarios necessary to emulate prompted activities such as pay-by-phone banking, account balance verification and debit card calling.

Call generators are becoming more sophisticated, often making it necessary for engineers to have access to multiple units over a TCP/IP LAN. A Feature Call Version 3.0 allows simple control of these call generators and provides user-selectable statistics to display multiple run-time gauges and graphs.

Any existing user of Niagara, Squirt or Crescendo call generators can use FeatureCall 3.0 to program and control them. Users with earlier versions of FeatureCall can upgrade for a fee.

Ameritec (Covina, Calif.)

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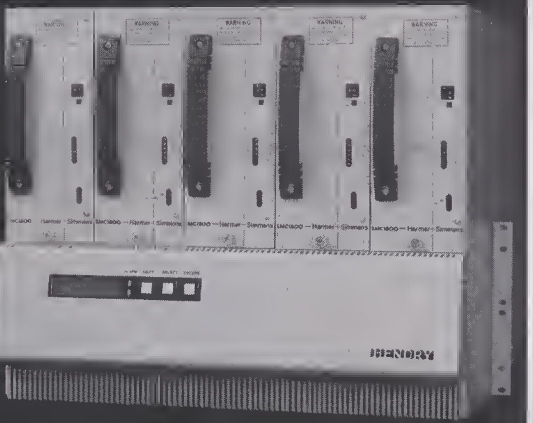

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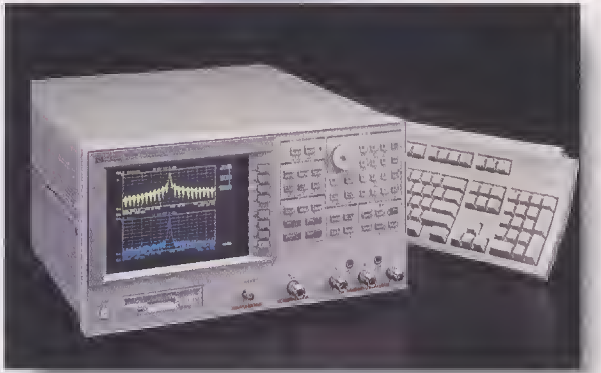

Combination analyzer

To help simplify testing for R&D and production test engineers, a 500 MHz combination analyzer provides network, spectrum- and optional-impedance-measurement functions in a single instrument.

By combining the functional performance of three instruments in one box, the HP 4395A combination analyzer helps reduce test costs without compromising performance. The combination analyzer also provides a clear and bright display via a color LCD unit thin film transistor (TFT).

The combination analyzer, which includes network-and spectrum-measurement functionality in one box, costs $26,500. Additional options are available.

Hewlett-Packard Co.(Palo Alto, Calif.)

Visit www.hp.com. or Circle 218

Compact power supply connectors

MQ172 compact power supply connector also doubles as I/O connectors for small hand-held devices.

Applications for the three-position series include hand-held items such as cellular phones, hand-held computers and personal digital assistants (PDAs).

The connector uses a stable, two-point mating contact and a snap latch with a positive "click" connection. Durability is assured through 5,000 insertions. "S-shape" spring contacts prevent stressing of solder joints.

The contacts have 3 amp capacity and accommodate 24 to 32 American Wire Gauge (AWG) wiring and choice of three key rings.

Cost of the MQ172 series costs $1.20 per mated pair in lots of 1,000. Lead time is 8 to 10 weeks.

Hirose Electric Inc. (Simi Valley, Calif.)

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17 ○ G Other Wireless Operator
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24 ○ N Internet Service Provider/Commercial Online Service Co.
25 ○ O Systems Integration/Outsourcing
26 ○ P Other Carrier
27 ○ O OTHER ____________ *(please specify)*

3. Which of the following describes your title classification? *(Fill in ONE only.)*

28 ○ 11 **Technical Mgmt.** (Engineering VP, Director or Mgr.; Technical VP, Director or Mgr.; Network VP, Director or Mgr.; Plant Mgr.)
29 ○ 12 **Engineering** (Network Designer, Engineer, Technician)
30 ○ 25 **Data Communications/Digital/IS/MIS Mgmt.** (Data Communications, Digital, I/S VP, Director or Mgr.)
31 ○ 13 **Mgmt.** (VP, General Mgr., System Mgr., Mgr., Director)
32 ○ 3 **Corporate Mgmt.** (Chairman, Owner, President, Partner, Executive/Senior VP/Director, Treasurer, CFO, COO)
33 ○ 4 **Legal, Financial, Regulatory or Processing Services** (Director or Mgr. of Rate Planning & Administration, Service Costs, Methods)
34 ○ 5 **Personnel & Administrative Services** (Director or Mgr. of Training, Safety, Security, Buildings & Land, Supplies & Distribution)
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4. Which of the follow equipment/services do you purchase, recommend, specify, approve or otherwise influence the purchase of? *(Fill in ALL that apply.)*

38 ○ A **Wireless/Cellular/Mobile/PCS Equip./Services**
39 ○ B **Central Office Equip./Services** (CO Switching Equip. [digital, ATM], Programmable Switches, Operations Support Systems, Workstations, CO Test, Hardware, Frames)
40 ○ C **Transmission and Broadband Distribution Equip./Services** (Digital Loop Carriers, Sonet, T1, Microwave, Satellites, Digital Cross Connects, Amplifiers, Passives, Cable, Long Haul Transmission Systems, Loop Distribution and Electronic Systems, Multiplexers)
41 ○ D **Cable/Video/Multimedia Equip./Services** (Headend Equip., Antennas, Switches, Receivers, Studio Equip., Audio Processors, Fiber/Coax Systems, Network Mgmt., Video Servers, Video Operations Support Systems, Set Top Equip.)
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48 ○ K None of the Above (A–J)

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The Telephone Line Emulator (TLE) consists of a base hardware platform with a software module providing advanced test capabilities, including programmable impairments, attenuation, impedance and Type-2/3 Caller ID. Software modules allow users to perform more advanced test operations or emulate international call progress and dial tones.

Users can start with the base hardware platform and upgrade as requirements change. Testers can create their own configurations via an intuitive Windows interface, and instantly modify programmable parameters. Real-world line conditions such as echo, white noise and satellite delay can be easily emulated. Additional features include: audio messaging, WAV files, multiple message playback, audio port and status display window for user feedback. It can be set up to operate as a four-part device or as a dual two-port unit.

The product lists for $1,995 for the base model. Advanced test and international software modules are $395 each, with additional modules planned for the future to support emerging public network features. *Teltone Corp. (Bothell, Wash.)*

Visit www.teltone.com or Circle 216

New Product information should be submitted to Debbie Sklar, Products editor at *America's Network*
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Compact power supply connectors

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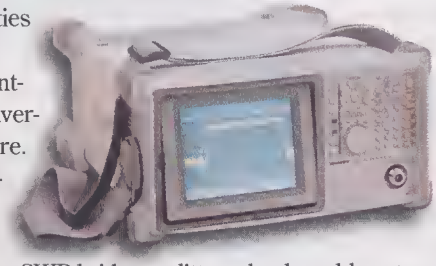
The contacts have 3 amp capacity and accommodate 24 to 32 American Wire Gauge (AWG) wiring and choice of three key rings.

Cost of the MQ172 series costs $1.20 per mated pair in lots of 1,000. Lead time is 8 to 10 weeks.
Hirose Electric Inc. (Simi Valley, Calif.)
Call 805/522-7958 or Circle 214

High-performance antennae measurement

The Basepak software package brings high-performance antennae capability to the Advantest U3641 spectrum analyzer. A Basepak-equipped U3641 is a one-box solution providing four of the essential tests for base station installation and maintenance—antennae measurements, transmitter measurements, spectrum monitoring, and filter/duplexer checks. It delivers antennae return loss and distance-to-fault readings to an external PC coupled via GPIB to a U3641 equipped with the optional tracking generator.



The product's existing spectrum measurement capabilities include occupied bandwidth, adjacent-channel leakage, average power and more.

An optional connection hardware kit (Option 1) provides the necessary SWR bridge, splitters, loads, cables etc. to complete the measurement solution. *Tektronix (Beaverton, Ore.)*

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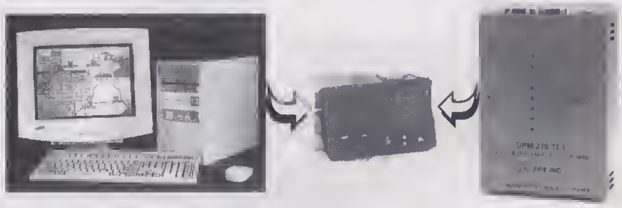

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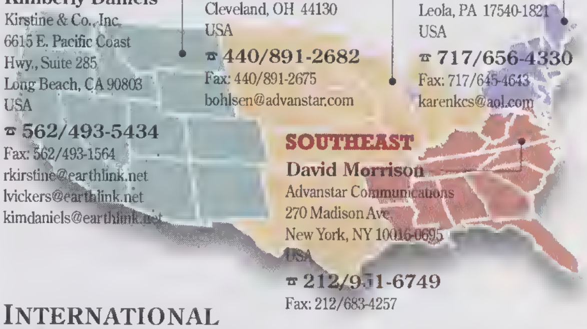

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A visitor was admiring the scenic picture. It shows the wolf howling at the moon-lit sky. Four other wolves are standing in the snow. He had seen similar scenic art painted by Frank Miller with purple Grand Champion and Best of Show awards on them at the Utah State Fair. "Where did we get it?"

We allowed that Frank Miller's place is way, way out there in the scrubland northwest of the junction of the oil road 20 miles south of Grouse Creek and 10 miles east of the Nevada border. He bought the land after Western Microwave paid Raft River Electric to build a 10-mile power line that just happened to pass by that section. (A *section* is 640 acres, or one mile square. It is a basic unit of land measurement in America.)

With power taken care of, Miller asked us for a phone. Our lines from Grouse Creek terminated 14 miles south at the Kimber Ranch; three pair on which subscriber carrier provided two drops. There was a radio path over the 8 miles from there to Miller's. Two more subscriber carrier channels were tied to a pair of 450 MHz subscriber radios. Miller had his phone.

HOT SUMMERS, COLD WINTERS, MUCH FIBER

The usual problems were hot summers and cold winters. Faxes worked, but were slow. The guy used his phones so much that I had to add two more trunks into Grouse Creek. We learned that Frank is a painter; Western nature—scenic stuff. He wanted better phones, as he did business nationwide.

Our fiber route to Grouse Creek passed 3 miles from Miller's. So, one day I had a chat with the Bureau of Land Management government guys. With untypical consideration, right then, within 30 minutes, I got the right of way to plow through their mile to get to Miller's. Eventually, we plowed three miles of six-fiber from our toll route through the boonies to Miller's place.

Getting circuits to a subscriber this way was much different than conventional practice. Turned out to be half the cost to route a T1 over existing fiber from a switch 46 miles distant than the former service office 22 miles away. So, when someone dials 435/747-7171, it comes through Salt Lake City and 130 miles to my tandem. The number is then translated to a Nevada code. That, in turn, routes through our Pilot switch, where it goes piggyback, to the Lucin regenerator, and then, on a fiber pair, the 11 miles to Miller's. Six phones. Blazing 56K connections to the network.

So, that's why we have those "donated" lovely scenic paintings on our office walls. Frank says that without his "fiber to the barn," he would not be the success he is. Indeed.

THE INTERNET SHOW

Boardwatch magazine has come from an Internet eXchance Point newsletter to a status today as *the* definitive magazine for Internet service providers (ISPs). Over the years, the magazine has hosted annual sessions for ISPs, watching the number increase from 1,500 in early '96 to more than 4,000 by mid '97. The 1997 meeting showed that the industry has grown to an aggressive adult from its boisterous teens.

The convention was spread out willy-nilly over three floors and a warren of lecture rooms packed in lower floors of the San Francisco Hilton. Things got off to a rocky start—mostly due to the massive attendance of guys who, well, were *very smart* computer nerds riding the wave they had carved—which is the fastest growing segment of the telecommunications industry. Very visible sponsors included 3Com, Rockwell, Bay Networks, Cisco, Compac and Digital.

Robert Pepper, chief of the Federal Communications Commission office of Plans and Policy, says he "was from the government, and was here to help you." The gist of his talk focused on the old saw about the dangers of asking the government for anything—as you might not like the regulation that you get.

Many, many experts lectured on all facets of the industry. I made sure to attend any session Jack Richards was on—as that was where the best action was/is. ■

When Art's not patronizing the arts, he heads Beehive Telephone Co. (Wendover, Utah) and can be reached at artb@beehive.net.

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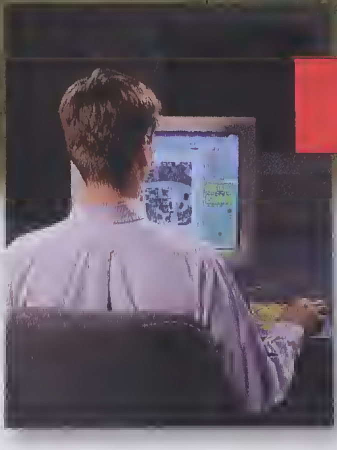

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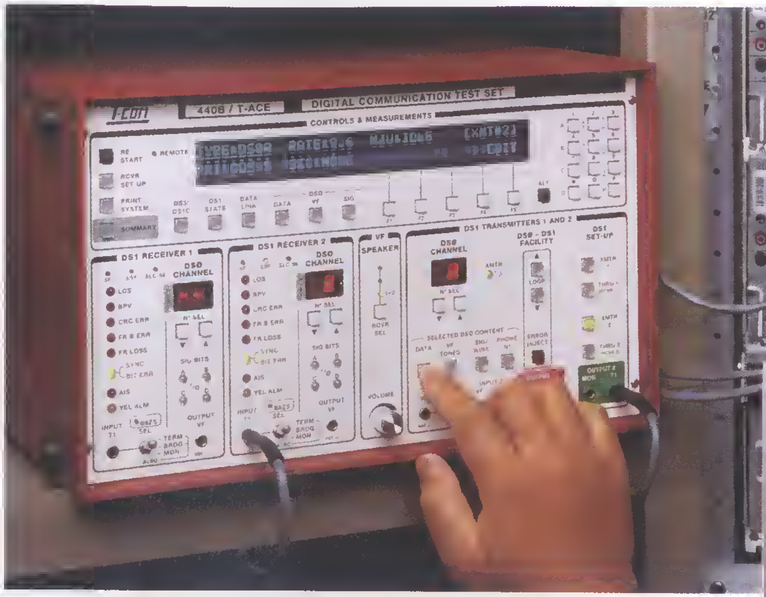

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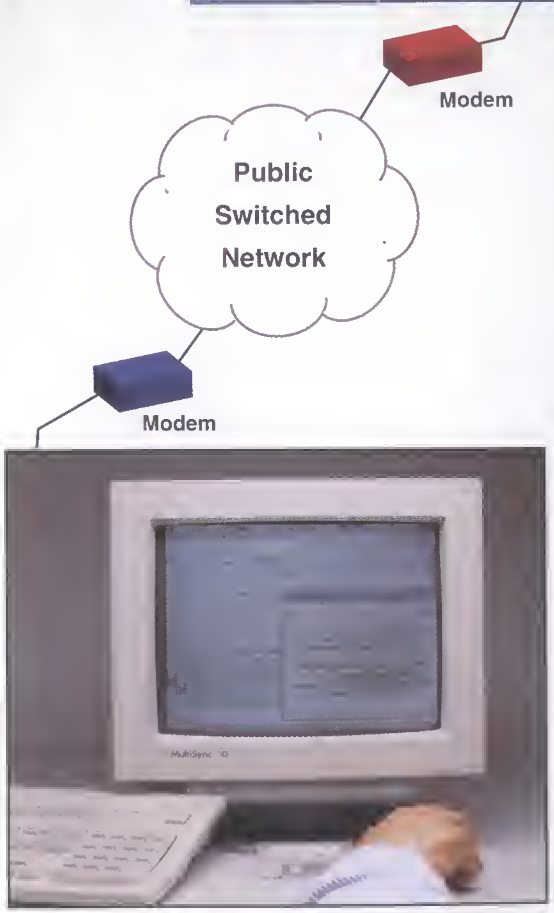

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